RGJ #4

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

J. Lamb / K-25 CEP

Requestor / Document Center (is requested to provide the following document)

Date of request 4/28/95 Expected receipt of document 5/20/95

Document number none Date of document

Title and author (if document is unnumbered)

Investigation Report Krypton Release ORNL 4/2/76

(This section to be completed by Document Center)

Date request received 4/28/95

Date submitted to ADC — older than 1985

Date submitted to HSA Coordinator 5/1/95

(This section to be completed by HSA Coordinator)

Date submitted to CICO

Date received from CICO

Date submitted to ChemRisk/Shonka and DOE

(This section to be completed by ChemRisk/Shonka Research Associates, Inc.)

Date document received

Signature

Sent to ORNL for processing on 05/03/95

ChemRisk Document No. 2525

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

February 7, 1977

Union Carbide Corporation
Nuclear Division
ATTN: Dr. Herman Postma
Director
Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, Tennessee 37830

Gentlemen:

KR-85 RELEASE AT ORNL BUILDING 3026 ON APRIL 2, 1976
(YOUR LETTERS 11/2/76 and 2/1/77)

The completion of implementation of the recommendations as described in your letters is considered to be satisfactory. The cooperation of ORNL during the investigation and the good response by ORNL to the recommendations is appreciated.

Sincerely,

Joseph A. Lenhard

OS:WLS

J. A. Lenhard, Director
Research & Technical Support Division

cc: C. A. Keller
R. F. Hibbs, UCCND

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

UNION CARBIDE

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

OFFICE OF THE DIRECTOR

February 1, 1977

United States Energy Research and Development
Administration, Oak Ridge Operations
Attention: Mr. J. A. Lenhard
Post Office Box E
Oak Ridge, Tennessee 37830

Gentlemen:

^{85}Kr Release at ORNL, Building 3026, on April 2, 1976, Your Letter August 24, 1976, ORNL Reply November 2, 1976

In our reply of November 2, we reported on the implementation status of all the Investigation Committee recommendations and considered them all completed with the possible exception of No. 1. On recommendation No. 1 we reported that the Radioactive Operations Committee (ROC) preoperational review of the facility resulted in additional recommendations to be implemented prior to resuming operation.

We are now pleased to report that all the ROC preoperational recommendations have been completed including a final full-scale ROC review of the facility.[1] This review resulted in additional recommendations which were subsequently completed sufficient to allow column unloading operations to resume.[2]

Since resumption of operations, one bank of columns has been unloaded without incident and full implementation of the remaining ROC review recommendations has been either completed or scheduled to be completed during the shutdown period after column unloading. The remaining columns are expected to be unloaded in February with the completion of all ROC recommendations to follow shortly thereafter.

Sincerely,

Herman Postma

Herman Postma
Director

HP:GHB:bb

cc: F. R. Bruce
G. H. Burger
F. L. Culler
R. F. Hibbs
M. E. Ramsey
C. R. Richmond
M. W. Rosenthal
D. B. Trauger
A. Zucker
File - RC

1. ORNL/CF-76/424, November 23, 1976, "Radioactive Operations Committee (ROC) Review of Building 3026-C Thermal Diffusion Enrichment Facility"

2. Memo December 3, 1976, to R. E. Brooksbank from R. W. Schaich, Radioactive Operations Committee Recommendations for the Krypton Thermal Diffusion Column Operations

A9.3-1

Oak Ridge National Laboratory

OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

UNION CARBIDE

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

OFFICE OF THE DIRECTOR

November 2, 1976

United States Energy Research and Development
Administration, Oak Ridge Operations
Attention: Mr. J. A. Lenhard
Post Office Box E
Oak Ridge, Tennessee 37830

Gentlemen:

<u>^{85}Kr Release at ORNL, Building 3026, on April 2, 1976, Investigation Report Issued June 30, 1976, Your Letter August 24, 1976</u>

We offer the following in reply to your comments of August 24 and as follow-up on our August 11 statement of implementation of the Investigation Report recommendations.

<u>Recommendation No. 1.</u> (1) A review of the facility modifications by the Radioactive Operations Committee (ROC) resulted in five additional recommendations to be implemented prior to resumption of withdrawal operations. Among these is a requirement for another full scale ROC review after all recommendations are completed and before operations resume. (2) All gas handling systems and radioactive operations at the Laboratory have been reviewed in light of the ^{85}Kr accident and changes in the equipment and procedures instituted when appropriate to prevent similar occurrences.

<u>Recommendation No. 2.</u> The requirement to notify Health Physics immediately when radioactive material is released has again been reemphasized. As standard practice, Health Physics is always consulted as the authority for determining radiation exposure levels. The requirement for this consultation has also been reemphasized to all operating Divisions.

<u>Recommendation No. 3.</u> The review of radioactive operations in all Divisions has been completed and resulted in the institution of some equipment and procedure changes. The requirement of internal review and, when appropriate, by a Laboratory Director's Review Committee, of all procedures and equipment and procedure changes was directed by letter to all Divisions.

Recommendation No. 4. We have made a study of the desirability of establishing an audit system for the emergency preparedness program. We believe that adequate steps have been taken to assure compliance with Laboratory emergency plans and philosophy. This includes quarterly meetings with Division Safety Officers, annual audits of local emergency plans, periodic emergency drills, and Division-wide use of the ORNL slide presentation on emergency planning. These steps are considered sufficient to assure correct interpretation and compliance with ORNL emergency procedures. If these measures prove to be unsatisfactory, we will then institute an audit system.

Recommendation No. 5. Provisions have been completed to ensure that a beta-gamma continuous air monitor and a monitron are in operation at the withdrawal station before resumption of operations at the withdrawal station.

Recommendation No. 6. This recommendation has been implemented as previously reported in our letter of August 11, 1976.

The internal review of radioactive operations by Laboratory Divisions as required in item 3 of our August 11 letter was completed. This review resulted in some minor changes in equipment and procedures which are now essentially completed. No major problems were found that presented a potentially serious personnel hazard.

We trust that the actions described in this report constitute satisfactory implementation of the six recommendations resulting from the investigation.

Sincerely,

Herman Postma

Herman Postma
Director

HP:GHB:bb

cc: R. G. Affel
F. R. Bruce
F. L. Culler
R. F. Hibbs
M. E. Ramsey
C. R. Richmond
M. W. Rosenthal
D. B. Trauger
A. Zucker
File - RC

A9.5-9

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

August 24, 1976

1976 AUG 25 PM 3 1c

Union Carbide Corporation
Nuclear Division
ATTN: Dr. Herman Postma
Director
Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, Tennessee

Gentlemen:

KR-85 RELEASE AT ORNL BUILDING 3026 ON APRIL 2, 1976 (YOUR LETTER, 8/11/76)

Your implementations of the recommendations are generally satisfactory. We have the following comments.

Recommendation No.1 - The implementation pertains to the ^{85}Kr withdrawal system and seems adequate for that system. What are the implications of this experience for other ORNL gas-handling systems?

Recommendation No.2 - We suggest that this implementation be strengthened by establishing a requirement that Health Physics be notified immediately any time a release has occurred and that Health Physics be consulted in making a decision as to whether or not a significant radiation exposure might have occurred.

Recommendation No.4 - Presumably the instructions described in this implementation are no different from those existing prior to the incident. Has ORNL considered the desirability of an audit system to assure correct interpretation of and compliance with procedures and requirements?

R. J. Hibbs

I would appreciate receiving your response to these comments.

Sincerely,

Joseph A. Lenhard

Joseph A. Lenhard, Director
Research and Technical Support Division

OS:WLS

cc: R. F. Hibbs, UCC-ND
C. A. Keller, AMO
W. H. Travis, S&EC

A9.5-9

OAK RIDGE NATIONAL LABORATORY

OPERATED BY

UNION CARBIDE CORPORATION

NUCLEAR DIVISION

UNION CARBIDE

1976 AUG 12 AM 10 27

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

OFFICE OF THE DIRECTOR

August 11, 1976

United States Energy Research and Development
Administration, Oak Ridge Operations
Attention: Mr. J. A. Lenhard
Post Office Box E
Oak Ridge, Tennessee 37830

Gentlemen:

^{85}Kr Release at ORNL Building 3026 on April 2, 1976

The following is a report on the implementation of the six recommendations contained in the investigation report issued June 30, 1976.

1. The ^{85}Kr withdrawal system has been redesigned to include an enclosure around the station which is connected to the cell exhaust system, metal tubing and fittings and a high pressure manometer with check valves. This system is currently being installed and will be reviewed by the Radioactive Operations Committee before operations are resumed.

2. It is standard Laboratory practice to obtain dose assessment of personnel suspected of radiation exposure as soon as practicable. The necessity for the retention of personnel to assess the dose depends upon the nature of the radioactive material and whether the exposure is internal or external. The retention or release depends upon the dosimetry methods applicable to a particular case with corrective actions based upon the situation as it develops.

   All Divisions have been directed to immediately notify Health Physics of all cases where a significant radiation exposure is suspected so that an early dose assessment may be made.

3. To provide increased assurance of compliance with existing procedures, all Divisions have been instructed to review all operations which involve the potential for significant exposure of personnel to ionizing radiation or the accidental release of significant quantities of radioactivity. This review will determine if adequate procedures are available and current.

   Each Division will assure that future procedure or equipment changes will receive approval and, when appropriate, will be reviewed by the Laboratory Director's Review Committees.

4. All Divisions have been instructed to familiarize responsible personnel with the Laboratory's emergency plans and to take the steps necessary to implement these plans.

5. A beta-gamma continuous air monitor and a monitron will be located adjacent to the withdrawal station to indicate ^{85}Kr leaks from the primary system or from the ventilation enclosure.

6. Health Physics Procedure 2.6 has been revised to reflect the lower quarterly skin dose limits in accordance with ERDAM 0524. Current Laboratory procedures are clear on work restriction requirements for radiation overexposure. The implementation of these procedures and the necessity for preventing overexposure has been reemphasized to the Health Physics Division.

The reviews requested in item 3 will be completed by September 30. These reviews will determine the schedule for complete compliance. A six months progress report will be made.

Sincerely,

Herman Postma

Herman Postma
Director

HP:bb

cc: R. G. Affel
F. R. Bruce
F. L. Culler
R. F. Hibbs
M. E. Ramsey
C. R. Richmond
M. W. Rosenthal
D. B. Trauger
A. Zucker
File - RC

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

①RGJ
② RF 18

1976 JUL 2 AM 9 37

June 30, 1976

Union Carbide Corporation
Nuclear Division
ATTN: Mr. Roger F. Hibbs, President
Post Office Box Y
Oak Ridge, Tennessee

Gentlemen:

KR-85 RELEASE AT ORNL BUILDING 3026 ON APRIL 2, 1976

The ORO investigation of this occurrence has been completed and copies of the investigation report and the recommendations have been sent through our contract administrator channel to Dr. Postma for appropriate action. For your information I am enclosing a copy of the report and the recommendations and a copy of the letter to Dr. Postma.

The cooperation of Carbide during this investigation is appreciated.

Sincerely,

for Charles A. Keller
R. J. Hart
Manager

OS:WLS

Enclosures:
1. Inv. Rpt. Subject Release
2. Board Recommendations
3. Info. for Rec. No. 6
4. Ltr. Lenhard to Postma

cc w/o encl:
J. A. Lenhard, R&TS
W. H. Travis, S&EC
C. A. Keller, AMO

ORIGINAL

RECOMMENDATIONS RESULTING FROM THE INVESTIGATION OF A KR-85 RELEASE IN BUILDING 3026 AT ORNL ON APRIL 2, 1976

It is recommended that:

1. The Kr withdrawal station design and equipment be reviewed by appropriate laboratory review committees and upgraded as necessary to afford added protection against Kr releases. Furthermore, the improved safety features should be incorporated in other gas handling systems at ORNL.

2. In all instances where radioactive material is released, all affected personnel should be retained for dose assessment until released by Health Physics.

3. ORNL establish a mechanism to assure compliance with existing procedures which require the review and approval of proposed changes to operating procedures, systems, and/or equipment affecting personnel safety.

4. The necessary steps be taken to convey and assure compliance with established plant emergency plans and philosophy.

5. That a CAM be positioned as close to the withdrawal station as possible for early detection of Kr releases.

6. ORNL's procedures be modified to assure that employees, with radiation exposures near or exceeding ERDA radiation exposure limits, are placed on work restriction where radiation exposure can be controlled.

Enclosure 2

Additional Radiation Exposure to Employee B

On June 22, 1976, ORNL reported that Employee B who received a 6 Rem skin exposure from the Kr-85 release on April 2, 1976, had received an additional 0.7 Rem skin exposure since that release. This brings his quarterly skin exposure to 6.7 Rem. The quarterly skin exposure limit is 5 Rem.

It was stated that so much concern was placed on the 15 Rem skin exposure of Employee A, also exposed during the Kr-85 release, and the restricting of his work activities, that the need to also restrict Employee B's exposure until July 1, 1976, was apparently overlooked. ORNL Health Physics had thought that both employees would be on work restriction since a memorandum was transmitted to their supervisors specifying their respective exposures. It is the responsibility of the employee's supervisor to place the men on restriction.

ORNL is reportedly taking steps to preclude a recurrence of this type. Nevertheless, ORO should formally go on record and add a sixth recommendation to the investigation report to read as follows:

> It is recommended that ORNL's procedures be modified to assure that employees with radiation exposures near or exceeding ERDA radiation exposure limits are placed on work restriction where radiation can be controlled.

Enclosure 3

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

June 30, 1976

Union Carbide Corporation
Nuclear Division
ATTN: Dr. Herman Postma
Director
Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, Tennessee

Gentlemen:

KR-85 RELEASE AT ORNL BUILDING 3026 ON APRIL 2, 1976

The ORO investigation of this occurrence has been completed and three copies of the investigation report and the recommendations are enclosed for your action as appropriate. Please note that recommendation No.6 was added because of an event related to this occurrence which was reported after the investigation report had been prepared. Therefore, the information on which the added recommendation is based is not included in the report but rather in a separate enclosure (Encl.3).

Please advise me within 30 days of your plans and schedules for implementing the recommendations. Also, I would appreciate your giving me a report on the status of the recommendations each six months until the recommendations are fully implemented.

Sincerely,

Joseph A. Lenhard

Joseph A. Lenhard, Director
Research and Technical Support Division

OS:WLS

Enclosures:
As stated above (3)

cc w/o encl:
R. F. Hibbs, UCC-ND
C. A. Keller, AMO
W. H. Travis, S&EC

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

Encl. 4.

ES H no. 6.

INVESTIGATION REPORT
KRYPTON RELEASE
OAK RIDGE NATIONAL LABORATORY

APRIL 2, 1976

ISSUED: JUNE 18, 1976

Encl. 1

INVESTIGATION REPORT

KRYPTON RELEASE

OAK RIDGE NATIONAL LABORATORY

APRIL 2, 1976

ISSUED: JUNE 18, 1976

TABLE OF CONTENTS

FIGURES

I. SCOPE OF INVESTIGATION

This is the report of the committee appointed by the Manager of Oak Ridge Operations Office (OROO), Energy Research and Development Administration (ERDA) (see Exhibit 1) to investigate the incident involving the release of approximately 50 curies (Ci) Krypton-85 (^{85}Kr) on April 2, 1976, at Oak Ridge National Laboratory (ORNL) operated for ERDA by Union Carbide Corporation, Nuclear Division (UCCND) under Contract W-7405-ENG-26.

A Type "B" investigation was conducted in accordance with ERDA Manual Appendix 0502, Part III (Standards for Investigation), and guidelines of the ERDA Accident/Incident Investigation Manual were followed. The investigation of the incident and the causal factors leading to the release was accomplished through:

1. Interviews with personnel,
2. Review of design drawings,
3. Review of operating procedures,
4. Post incident testing of equipment and components,
5. Photographs of the incident area, and
6. Use of a MORT (Management Oversight and Risk Tree) Chart

II. SUMMARY

At approximately 3:15 PM, April 2, 1976, about 50 Ci of ^{85}Kr valued at about $5,000 were released while withdrawing it from a thermal diffusion column in Building 3026C at ORNL. The maximum exposure received by attending personnel was determined to be a whole body skin exposure of 15 Rem and a penetrating exposure of 100 mRem. The Manager, ORO, appointed an investigation committee on April 6, 1976.

III. FACTS

A. Facility Background Information

The Thermal Diffusion Enrichment Facility located in Building 3026C at Oak Ridge National Laboratory (see Figure 1) began operating in the fall of 1965 for the purpose of enriching ^{85}Kr from an assay of approximately 3.5% to assays of up to approximately 40% for sale on the commercial market. In 1971, operations were temporarily discontinued for system upgrading which included installation of new tube bundles and a new refrigeration system. In June 1975, the facility was put back into operation.

Building 3026C contains two hot cells with the Krypton operation being in the east cell. The east cell is divided into quadrants, which contain two separate but identical operating cells, designated north and south, and two non-operating cells, one empty and one for Kr storage. Ventilation of these hot cells, as well as other hot cells in this area of ORNL, is accomplished by a fan discharging to the 3039 stack. Each of the cell quadrants is equipped with an individual exhaust duct and manual damper located on the cell roof (see Figure 2). With the damper open, the pressure of the cells is .4" H_2O vacuum in the north cell and .3" H_2O vacuum in the south cell. With the damper closed, there is no differential pressure. The hazard analysis report (see Exhibit 2) for this process states the cells will be maintained at 1" H_2O vacuum. However, operating personnel stated they were never able to obtain this vacuum. The

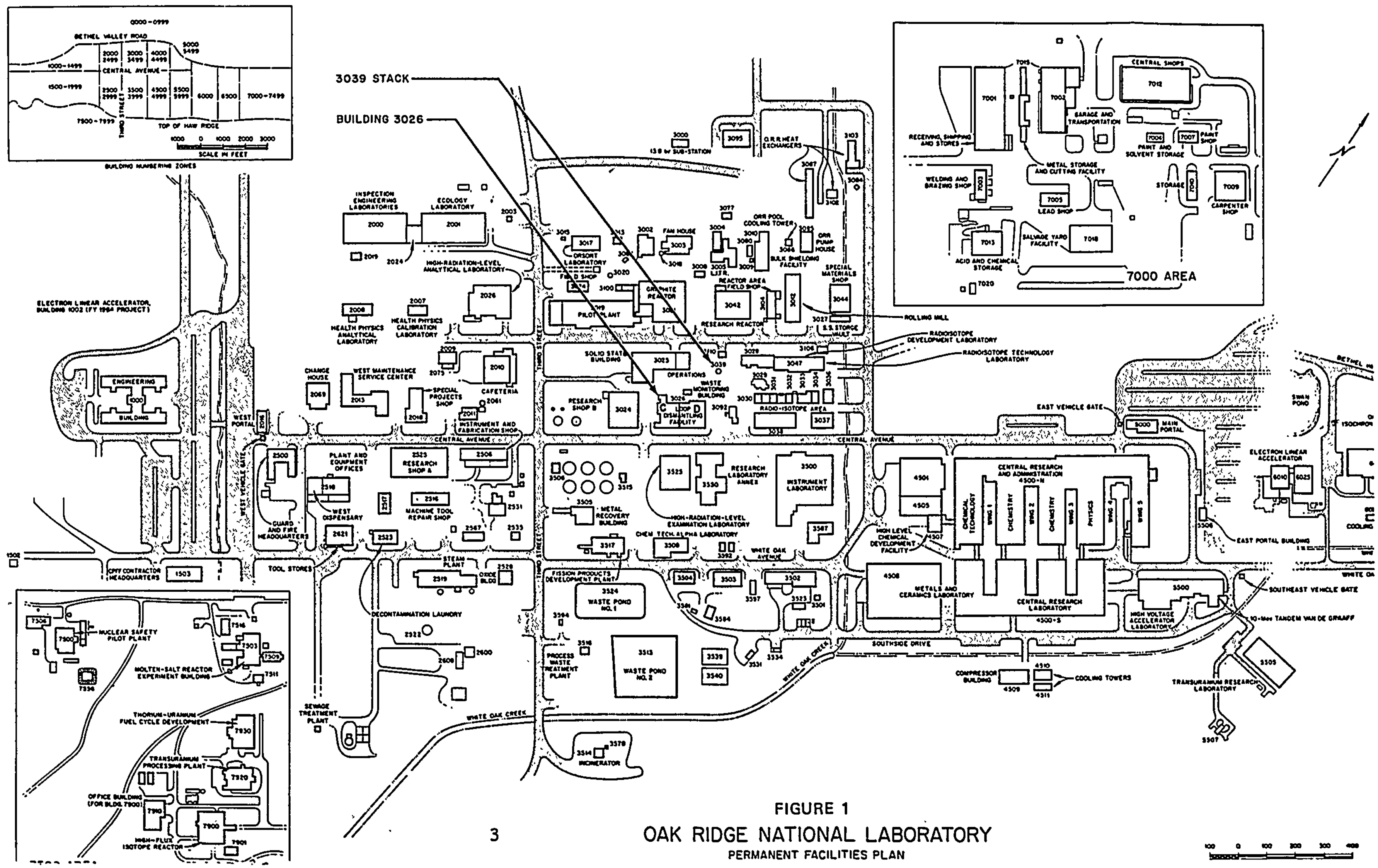


FIGURE 1

OAK RIDGE NATIONAL LABORATORY

PERMANENT FACILITIES PLAN

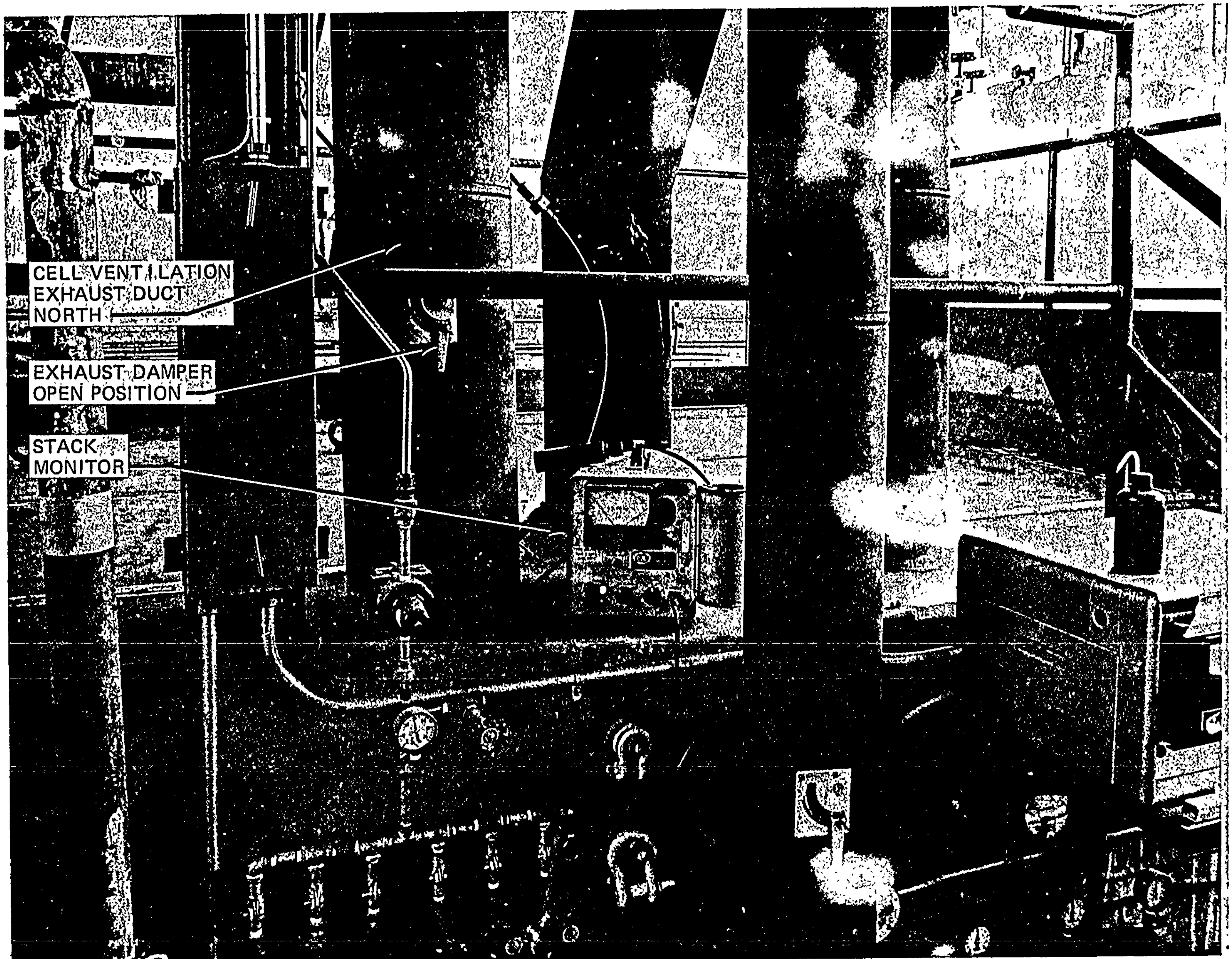


FIGURE 2   TOP OF EAST HOT CELL

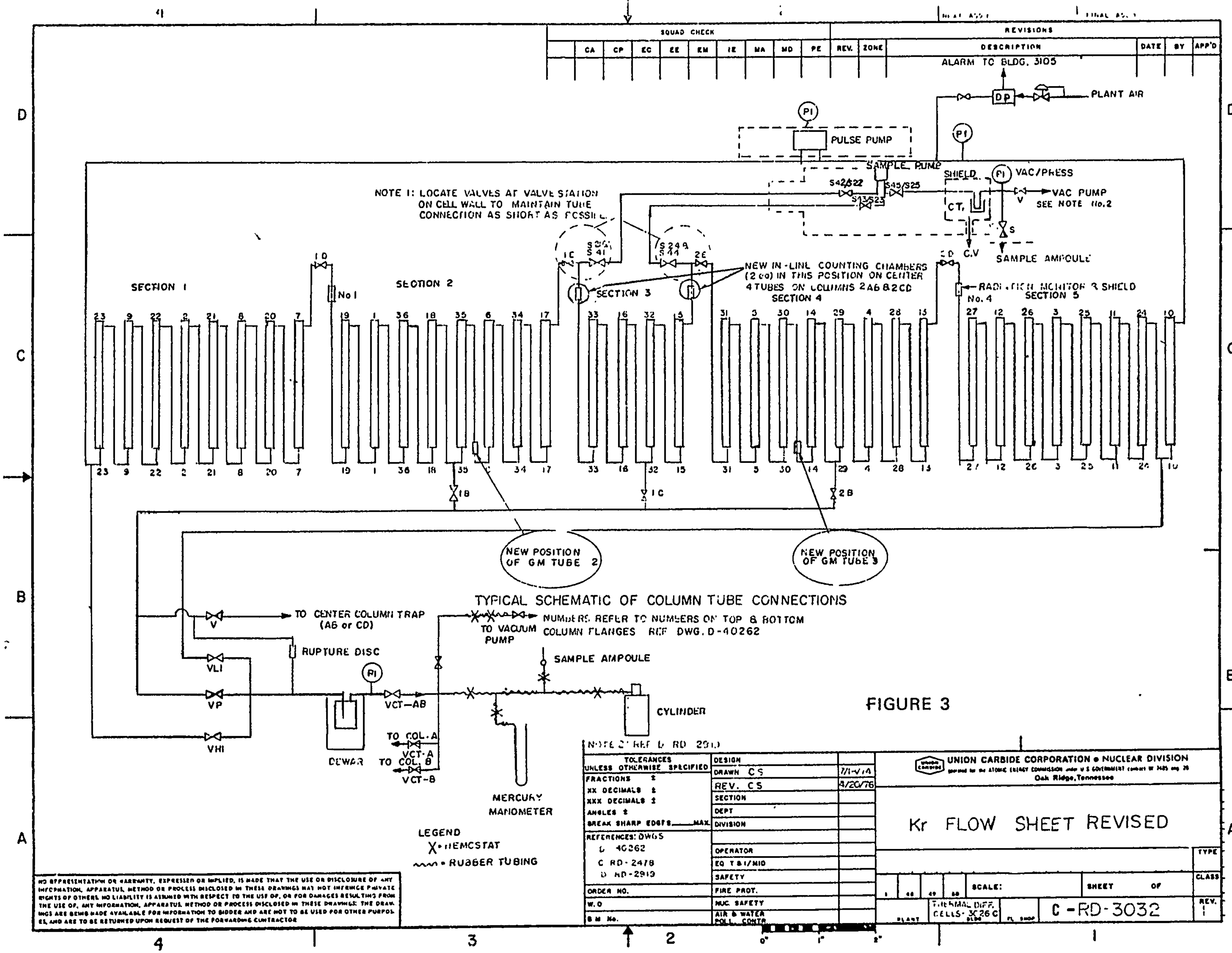
south cell contains three separate thermal diffusion systems (called columns) - Column C, Column D, and Column CD which have a common loadout station. The north cell contains three columns - Column A, Column B, and Column AB which also have a common loadout station.

Each column consists of a concentrically arranged tube bundle which is divided by valves into five sections (see Figure 3). The columns are filled with gaseous Krypton to approximately atmospheric pressure and heated with cal rods to a temperature of 550°F. Cooling water outside the tube produces a temperature differential and thus thermal diffusion.

After about 90 days of thermal diffusion, the ^{85}Kr is withdrawn from a column section, via a cold trap in the loadout station, into a Krypton gas shipping cylinder previously leaked tested and evacuated to less than 100 microns (μ) of Hg.

A vacuum system common to both loadout stations is used primarily to clear and evacuate the hookup lines from the cold trap to the shipping cylinder prior to each filling and is also used to evacuate the cold trap. The discharge of the vacuum system, which is common to the withdrawal stations of both cells, goes to the exhaust ventilating duct of the storage cell. The damper on the storage cell exhaust duct is kept open at all times.

During withdrawal, the air flow from the room into the cell, averaged over the face of the opening, is approximately 24 lfpm (linear feet per minute) with the damper open and approximately 3 lfpm when the damper is closed. At some unknown time in the past, it was decided



ALARM TO BLDG. 3105
PLANT AIR
DP
PI
PULSE PUMP
SAMPLE PUMP
SHIELD
VAC/PRESS
VAC PUMP
SEE NOTE No.2
CT.
C.V
SAMPLE AMPOULE
S42/S22
S43/S23
S45/S25
NOTE 1: LOCATE VALVES AT VALVE STATION ON CELL WALL TO MAINTAIN TUBE CONNECTION AS SHORT AS POSSIBLE
NEW IN-LINE COUNTING CHAMBERS (2 co) IN THIS POSITION ON CENTER 4 TUBES ON COLUMNS 2AB & 2CD
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
RADIATION MONITOR & SHIELD No. 4
No 1
NEW POSITION OF GM TUBE 2
NEW POSITION OF GM TUBE 3
TYPICAL SCHEMATIC OF COLUMN TUBE CONNECTIONS
TO CENTER COLUMN TRAP (AB or CD)
TO VACUUM PUMP
NUMBERS REFER TO NUMBERS ON TOP & BOTTOM COLUMN FLANGES REF DWG. D-40262
RUPTURE DISC
SAMPLE AMPOULE
CYLINDER
DEWAR
VCT-AB
TO COL. A
TO COL. B
VCT-A
VCT-B
V
VLI
VP
VHI
MERCURY MANOMETER
LEGEND
X = HEMOSTAT
= RUBBER TUBING
NOTE 2: REF D RD 2910
UNION CARBIDE CORPORATION • NUCLEAR DIVISION
Oak Ridge, Tennessee
Kr FLOW SHEET REVISED
DRAWN CS 7/1-74
REV. CS 4/20/76
REFERENCES: DWGS
D 40262
C RD-2478
D RD-2910
THERMAL DIFF. CELLS X-26C
C-RD-3032

FIGURE 3

to operate the cells containing the thermal diffusion columns with the ventilation exhaust dampers closed to slow down the release of Kr from the column to the cell in the event of a column leak. This logic is diametrically opposed to the reason for having cell ventilation as stated in the process safety evaluation; i.e., in the event of a major release inside the cell the Kr will be removed by the cell ventilation. This change in the cell ventilation system was made without the knowledge or approval of Safety and Radiation Control which has that responsibility. The dampers were closed during this withdrawal.

B. <u>Brief Withdrawal Operational Description</u>

A shipping cylinder, which has been previously leak tested and evacuated to 100 μ of Hg, is hooked to the outlet of the VCT valve with rubber vacuum wall tubing (see Figures 4,5,6). This tubing meets Union Carbide Corporation, Nuclear Division (UCCND) Specification 15-AC-11A for internal pressure of 125 psi (see Exhibit 3). A mercury manometer, sample ampoule, and the vacuum system are also hooked into the line with rubber tubing. Rubber bands are normally used for tubing clamps and hemostats are used for flow control and backup valving in the event of valve failure. A new sample ampoule and shipping cylinder are used for each withdrawal.

All valves on the column and loadout station are shut. The tubing connecting the withdrawal cylinder and the loadout station is evacuated. Gaseous Krypton is withdrawn from the desired column section by the cooling action of liquid nitrogen condensing Kr in a cold trap. The trap is isolated from the column and heated to vaporize the liquid Krypton. Valving is opened between the cold trap and the evacuated cylinder allowing the Krypton to fill the cylinder.

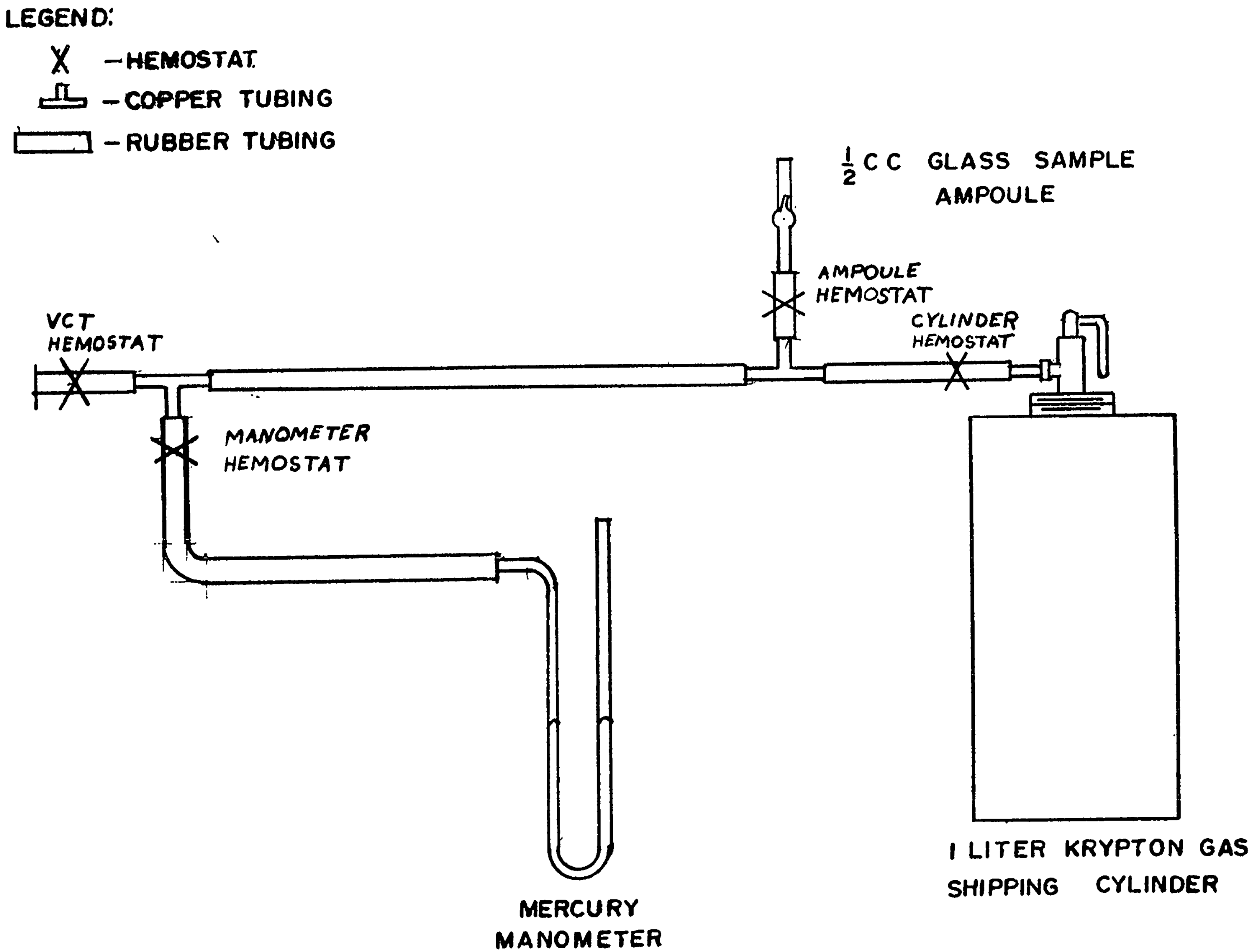


FIGURE 4. WITHDRAWAL CYLINDER HOOKUP FOR ^{85}Kr ENRICHMENT COLUMNS

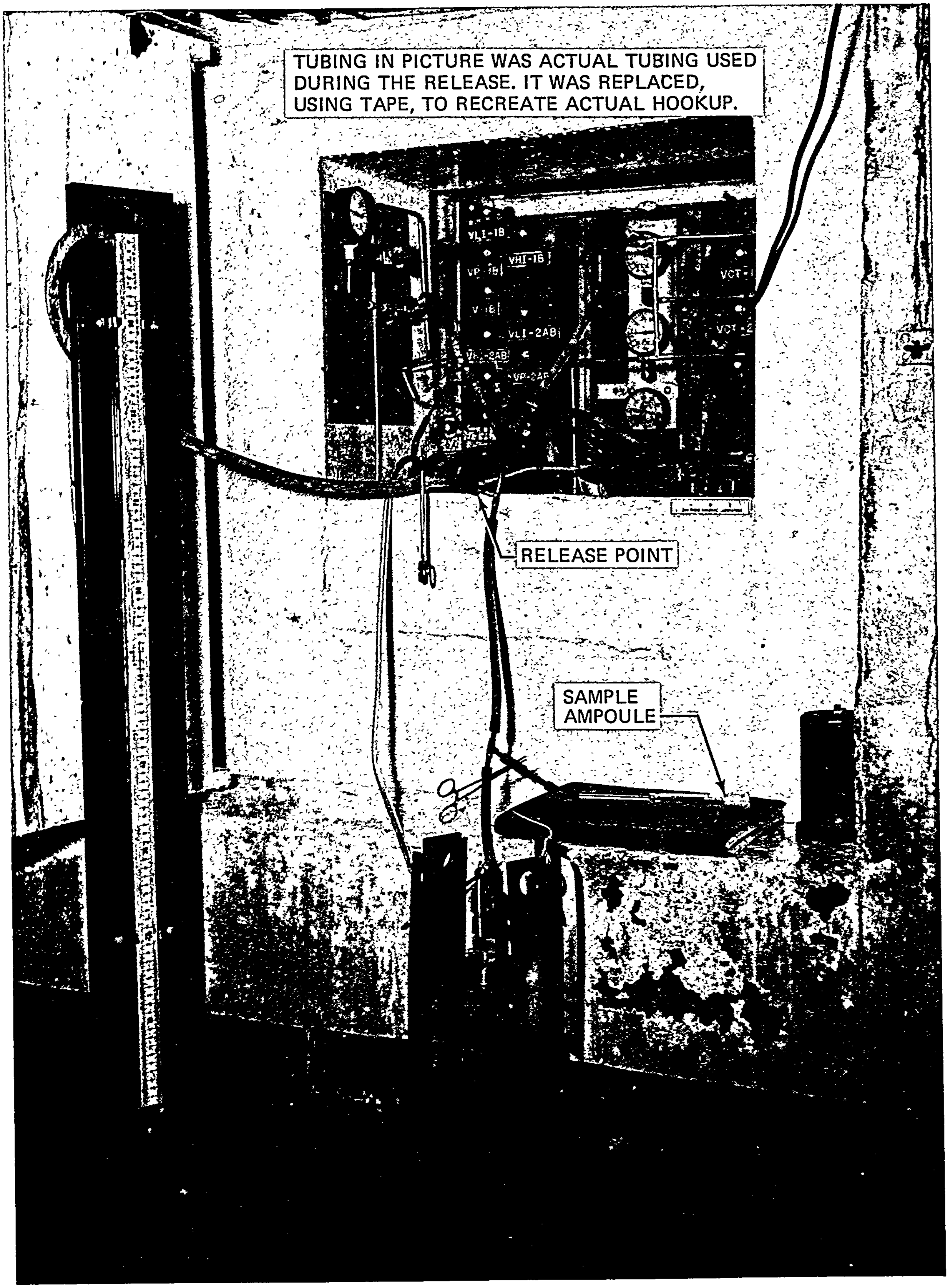


FIGURE 5 LOADOUT STATION

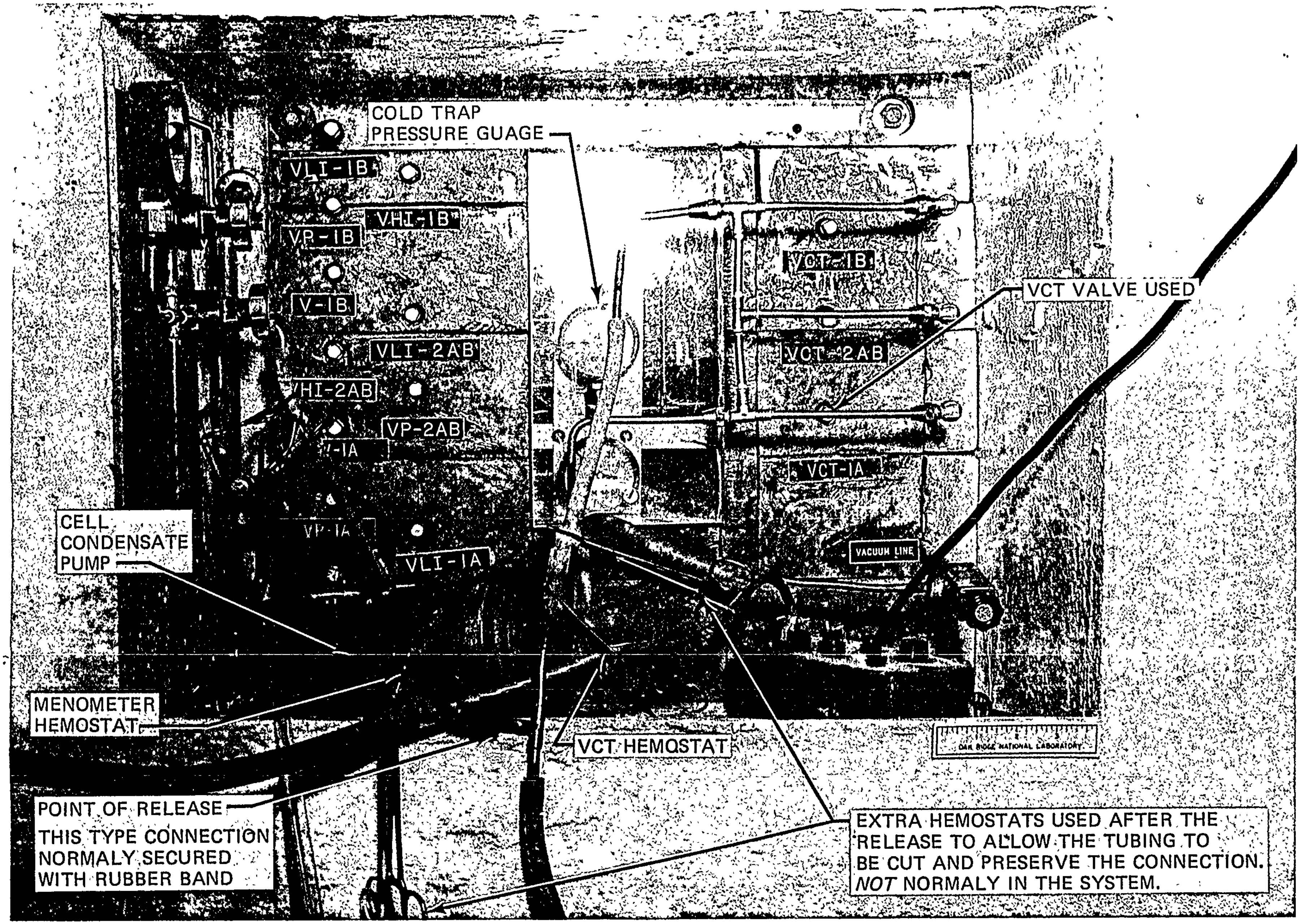


FIGURE 6 LOADOUT STATION CLOSE-UP

The pressure in the cold trap should be less than 5 psig to prevent overfilling the cylinder. There is no written specification for the maximum pressure, but a rupture disk is provided to relieve the unloading system at 60 psig.

A detailed product withdrawal procedure is in Exhibit 4 and varies slightly for the first withdrawal. Although this procedure was in existence, Employee A, the operator, had not seen it. Employee A stated he had 15 to 20 years experience working with Kr, and the loadout station in Building 3033 (his normal work area) is similar to the one in Building 3026C. Employee A stated he has operated the loadout station in Building 3026C 10 to 12 times.

C. Sequence of Events

April 2, 1976

Withdrawal of enriched gaseous Krypton began in the morning with Employee A, science technologist, performing the actual withdrawal and Employee B, supervising engineer, providing supervision and assistance to Employee A (see Figure 7). Health Physics was not present as required in the process safety evaluation. The interpretation of this requirement has been that Health Physics be available and make periodic checks of the operation.

The first two samples, which consisted mainly of waste material, were withdrawn before noon using the cylinder hookup shown in Figure 4 and described in the previous section. Rubber bands were not used for clamping the rubber tubing to copper tubing as in the normal withdrawal procedure. The third and forth withdrawals were performed after lunch. No release occurred during these withdrawals, and the maximum pressure observed in the cold trap was 2 to 3 psig during each withdrawal.

FIGURE 7 SIMULATED WITHDRAWAL OPERATION

The fifth withdrawal involved 9% enriched ^{85}Kr and was begun by Employee A evacuating the hookup lines. The cylinder and VCT valves were reinforced by hemostats. When the evacuation was completed, the cylinder valve hemostat was removed and the cold trap was heated. The pressure in the trap rose quickly and soon reached 20 psig. At this point, Employee A opened the VCT valve and slowly opened the VCT hemostat to prevent a sudden high pressure from blowing mercury from the manometer. Normally, the hemostat on the manometer is kept closed until the cylinder is full as the manometer is used only to measure the pressure in the filled cylinder. On this withdrawal, however, the manometer hemostat was open. When the pressure in the manometer exceeded atmospheric, it was isolated from the loadout station with a hemostat. Employee A then released the hemostat near the VCT valve and the pressure fell to 5 psig in the cold trap. Employee B decided that the cylinder was full, and to avoid overfilling the cylinder, he decided to fill the trap with liquid nitrogen. The following sequence of events then occurred:

3:15 PM The cell ventilation duct radiation monitor located on top of the cell alarmed. When the alarm sounded, as Employee A remembers, he clamped the VCT hemostat and shut the VCT valve. Employee B was in the process of opening the valves from the liquid nitrogen cylinder to the cold trap to freeze out any Krypton in the lines. Employee B noted that the column temperature alarms located nearby were normal. A soft shell cutie pie was at the loadout station but not being used. Employee C picked it up and observed radiation readings in excess of 10 R/hr. A soft shell cutie pie is an instrument capable of of measuring beta and gamma radiation. Employee C, the supervisor of Building 3026C, had entered the area at the start of the fifth withdrawal and stayed to observe.

Employee B passed the loadout station and proceeded to the stairs going up to the top of the cell to investigate the alarm (see Figure 8). Before he reached the top of the steps, the monitron on the top of the cell alarmed. A monitron is an area gamma and thermal neutron radiation monitor. The monitron is approximately four feet from the cell ventilation duct. As he reached the top of the steps, he observed that the constant air monitor (CAM), which is located in the same position as the monitron, alarmed (see Figure 9). The strip chart recorder for the CAM showed 3:15 as the time of the alarm. The CAM recorder had begun to swing down when Employee B reached the machine. The column pressure alarms, gauges, and bellows pump gauges, all of which are located on the top of the cell, were normal which indicated that the thermal diffusion columns were operating properly.

Employee B came back down the steps and as he did the CAM on the first floor, southside, alarmed. The building was evacuated without the aid of the evacuation alarm. The position of radiation monitoring devices and sequence of alarms are shown in Figure 10.

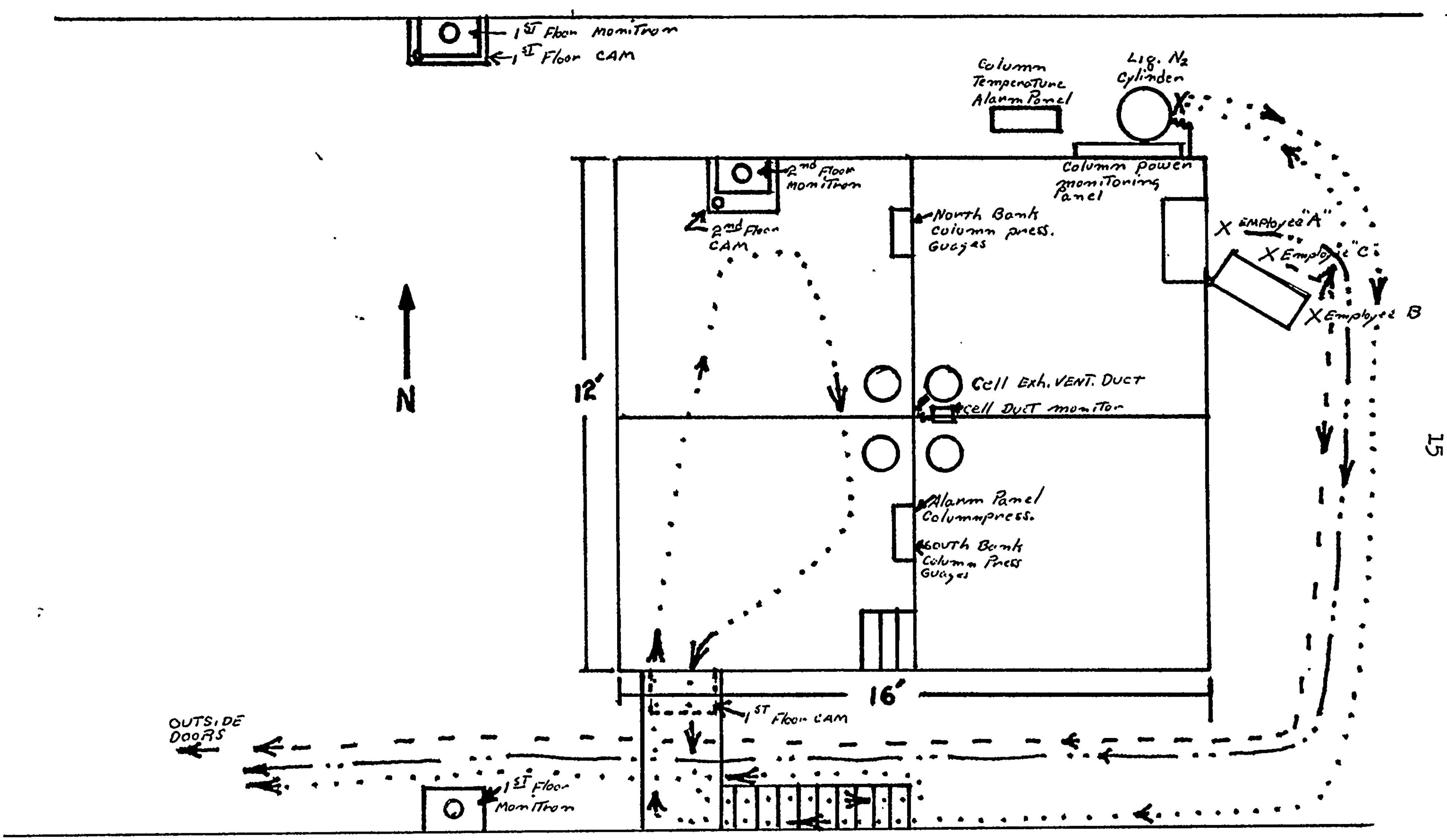


FIGURE 8 SKETCH OF PHYSICAL LAYOUT AND LOCATION OF PERSONNEL AND MOVEMENTS

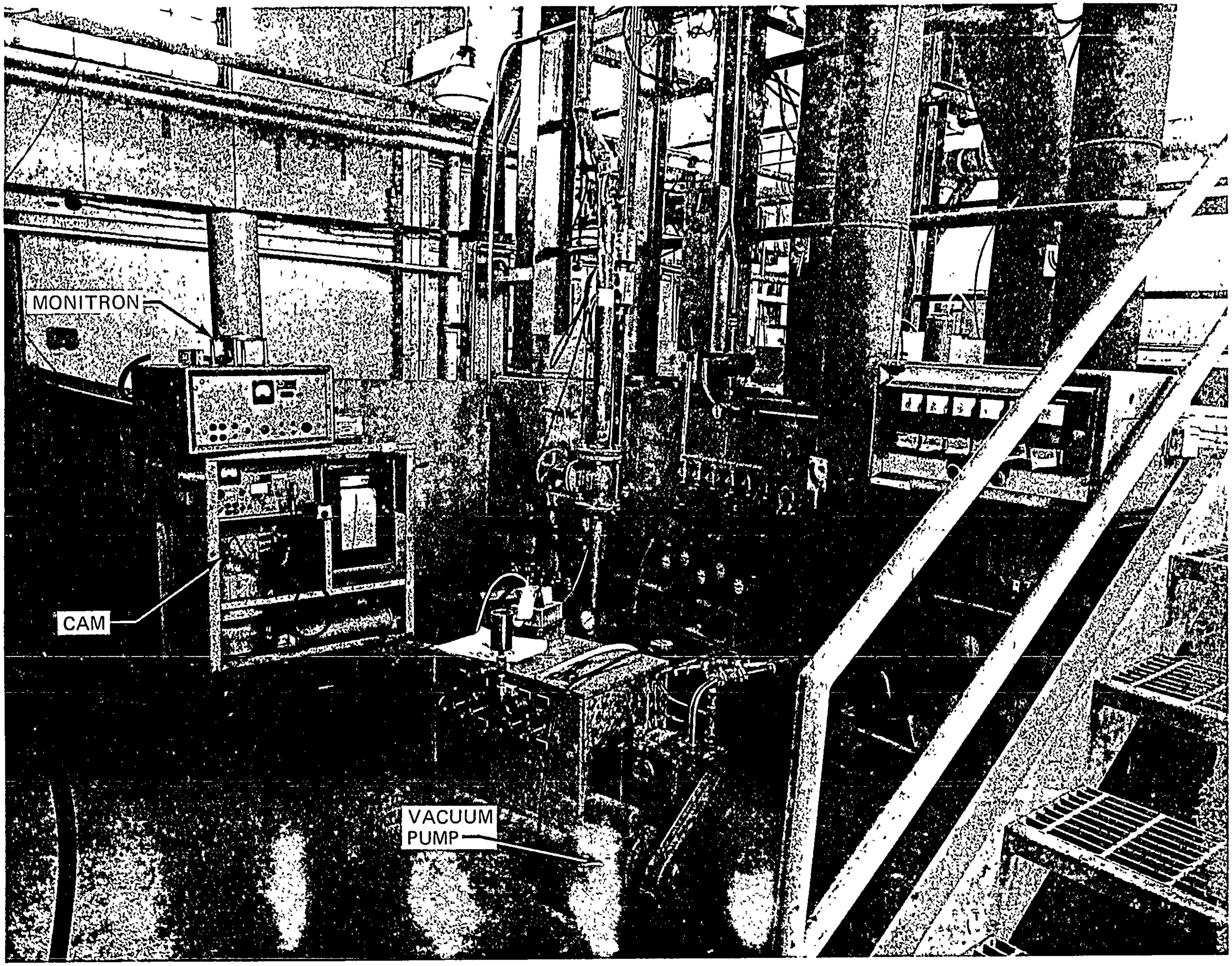


FIGURE 9 RADIATION MONITORS TOP OF CELL

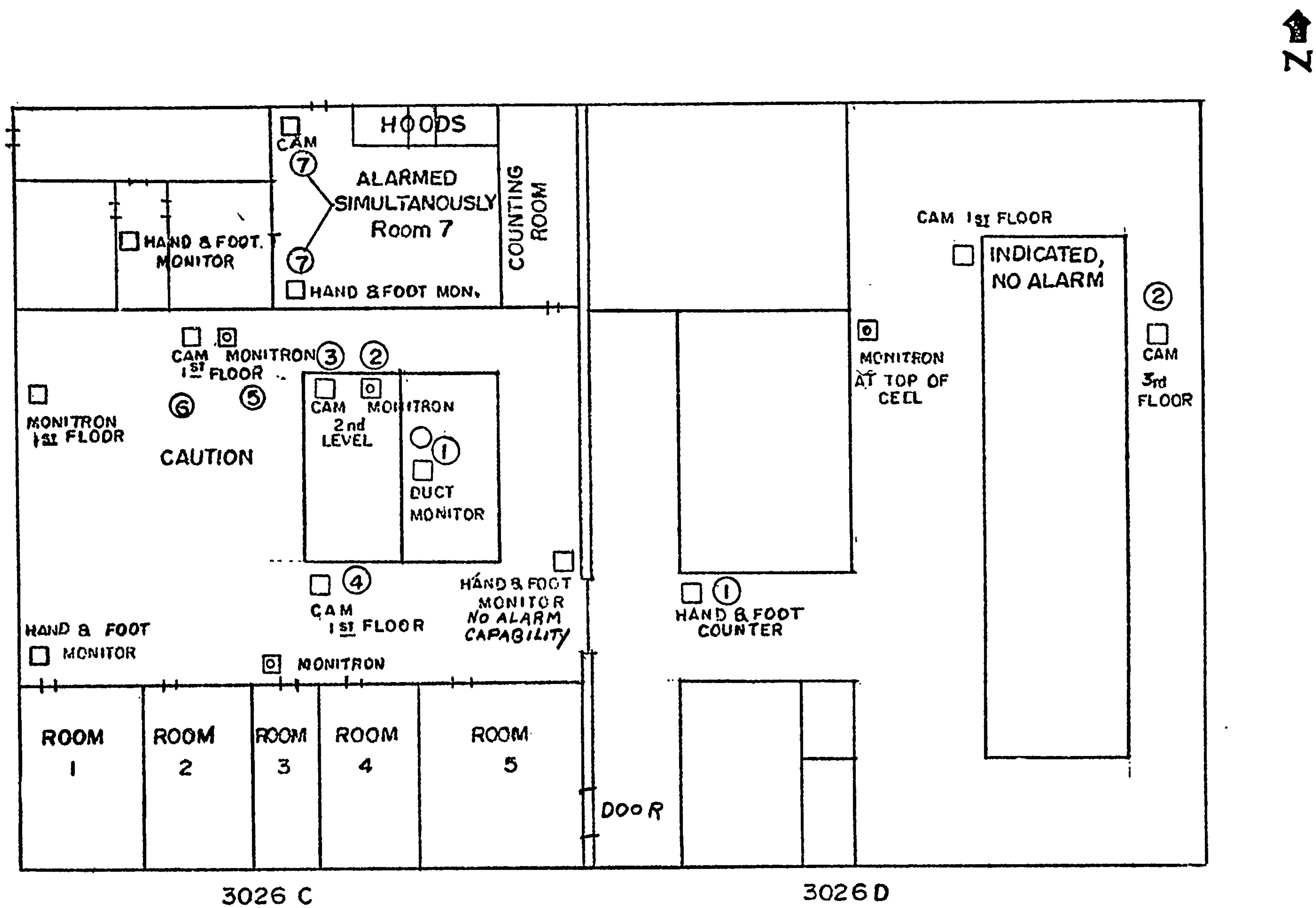


FIGURE 10
LOCATION OF RADIATION DETECTION INSTRUMENTS IN BUILDING 3026
(NUMBERS INDICATE SEQUENCE OF ALARM)

3:15 - 3:45 PM Employees A, B, and C carried out the following actions within an estimated five-minute period between 3:15 and 3:45. It is not possible to determine exactly when this five-minute period occurred.

Employee B reentered the building and opened the roll-up door on the west end to increase ventilation.

According to Employee A, he also reentered the building, crossed into Building 3026D and found the hand and foot radiation monitor alarming. He then informed Mr. Al Walls, supervisor of Building 3026D, of the problem in Building 3026C. Mr. Walls then evacuated Building 3026D.

Employee C opened the back door of Room 5 on the southside to increase ventilation. This door opens to a corridor leading to Building 3026D. He also called Mr. Gene Lamb, Radioisotope Department Superintendent, and informed him of the release.

The strip chart recorder for the inert gas monitor in the Building 3039 stack showed the Krypton going up the stack at 3:35 PM. This tape was removed from the recorder and its data reported to ORNL personnel. The tape was subsequently lost and unavailable to the investigators.

3:45 PM The CAM on the third level of Building 3026D alarmed at this time. The CAM on the first level also indicated an increase in radiation but not enough to alarm. According to Mr. Al Walls, he arrived at Building 3026D from another building at this time, evaluated the situation, and sounded the evacuation alarm. He then called John Hilyer of Health Physics.

Mr. Walls stated that he was not notified of the release by anyone from Building 3026C.

Mr. Hilyer arrived at approximately 3:50 PM. He and Mr. Walls entered Building 3026D and Mr. Hilyer discovered that the release was in Building 3026C. Mr. Charles Golden, another health physicist, was called by Mr. Hilyer and arrived around 4:00 PM.

Mr. Gene Lamb arrived and took charge of the emergency activities.

4:00 PM Employee A and Employee B entered the building since radiation readings had dropped to a safe level. Second floor windows and an emergency exit on the second floor were opened to increase ventilation. Employee B opened the hoods in Room 7 to increase air flow. The CAM and a hand and foot monitor alarmed simultaneously at that time. Employee B exited through the back door of Room 7.

4:10 PM	Radiation readings again appeared to be normal and the building was reentered. All alarms were quiet at this time. Employee A and Employee B returned to the cell operating area and began to disconnect the system for the weekend. The cylinder valve was closed and disconnected. All connections that had been clamped with a hemostat were clamped a second time and the rubber tubing cut between the hemostats. This preserved the connections for future examination and enabled the cell area to be secured for the weekend.
4:20 - 4:25 PM	Employee A received permission from Employee B to leave for the weekend.
4:30 PM	Health Physics decided to pull film badge components. Employee B's film badge was turned over to Health Physics personnel. Attempts to obtain Employee A's film badge before he left the plant site for a weekend trip out of state were unsuccessful.
4:47 PM	ORO was informed of the release by Mr. Frank Bruce, Associate Director for Administration. He talked to Mr. James Rounsaville, Research and Technical Support Division, and informed him that there was a minor Kr release in Building 3026 of about 50 Ci and that the film badges on two employees were pulled but no other information was available.

5:15 PM The ORNL shift supervisor, Stan Hornbaker, was advised of the release by ORO (James Rounsaville) who had called Mr. Hornbaker in an attempt to obtain additional information about the release.

6:30 PM Employee B's badge was processed and preliminary information indicated that he received 7 Rems to the skin and 20 mRem penetrating exposure. When informing Employee B of his exposure, ORNL Health Physics discovered that Employee C had been in the area of the release.

7:30 PM Employee C's film badge was picked up at his home by an ORNL health physicist. Employee C's badge indicated an exposure of 5 Rem to the skin and 20 mRem penetrating. It was then assumed that Employee A's exposure would be of the same magnitude as Employees B and C. Based on this assumption, Health Physics decided to wait until Monday morning to obtain and process his badge.

Saturday, April 3

4:40 PM Mr. Wayne Smalley, ORO, asked Mr. Hornbaker for the exposures of Employees B and C, but Mr. Hornbaker did not have this information.

6:00 PM Mr. Hornbaker received the exposure information from ORNL Health Physics.

8:00 PM Mr. Smalley was informed of the exposures by Mr. Hornbaker.

Monday, April 5

AM Employee A's badge was picked up along with six others associated with the release and emergency activities. All of the badges read zero with the exception of Employee A's and that of an individual who was still wearing his first quarter badge (2nd quarter badges were available on April 1, 1976). Preliminary information from Employee A's badge showed a 20 Rem skin exposure and 250 mRem penetrating. Employee A was put on work restriction. The individual still wearing the first quarter badge did not have any exposure which could be distinguished from his normal quarterly exposure.

Mr. Robert Hart, Manager, ORO, appointed an Accident Investigation Committee, to perform a Type "B" investigation of the incident.

D. Emergency Response

ORNL has established emergency procedures that give ultimate responsibility for coordinating emergency activities to the shift superintendent who is the Laboratory Emergency Director (LED). In addition, local emergency squads are formed and comprised of a local emergency supervisor, warden, searchers, and other squad members. The responsibilities of the local personnel include evacuation of the building, personnel accountability, and retention of all personnel until released by Health Physics, equipment shutdown as necessary, and the meeting and briefing of emergency units as they arrive. ORNL emergency procedures rely greatly on the knowledge and capability of the local emergency squads to control an emergency in their facility. The LED is additionally concerned with the emergencies effect on the laboratory as a whole. Emergency procedures for unusual occurrences are put into effect upon notification of either the emergency control center or the shift superintendent and the local emergency squad. Appropriate emergency units (fire, guard, ambulance, Health Physics, etc.) are notified and requested to respond.

According to the ORNL Emergency Manual and the ORNL Local Emergency Manual, an emergency is defined as "an unforeseen combination of events, which necessitates immediate action to protect personnel and property...." When the constant air monitors and monitrons started to alarm, supervisory personnel shut down the thermal diffusion system and withdrawal station. A quick survey of the equipment indicated that it was functioning properly. A radiation survey of the ground floor with a paper shell cutie pie, which was present at the withdrawal station showed radiation levels in excess of 10 R/hr. The building was evacuated without sounding the building evacuation alarm. Five people were present in the building and all were accounted for. The building supervisor, Employee C, assumed responsibility for the emergency activities and decided that the release was not serious enough to activate the plant emergency procedures. Therefore, neither the shift superintendent, the Emergency Control Center, nor Health Physics were notified. Employee C notified his immediate supervisor, the Radioisotopes Department superintendent, who arrived at Building 3026C approximately thirty minutes after the release and immediately assumed responsibility for all emergency activities. There was no verbal transfer of responsibility.

With the source of Kr secured, amelioration activities consisted of building ventilation which would allow the Kr to diffuse into the atmosphere. The building doors had already been opened and in the opinion of supervisory personnel in charge of emergency activities, plant emergency squads could supply no additional required assistance. Health physics personnel were summoned by the building supervisor for 3026D.

Health Physics decided to pull film badge components for dosimetric evaluation and was unaware, at that time, that Employee C was present during the release. Employee B's badge components were withdrawn. Employee A, however, had been allowed to leave for a weekend trip by his immediate supervisor. The decision to allow Employee A to leave was made without the knowledge or permission of the Radioisotopes Department superintendent or Health Physics. Post incident discussions with the department superintendent revealed that this decision was, in his opinion, acceptable because dose evaluations can be performed at a later date. Discussions with shift superintendents responsible for emergency preparedness indicated that all personnel involved in an incident are to be retained until dismissed by the person in charge of emergency activities and only after receiving concurrence from Health Physics, Medical, and/or Industrial Hygiene as applicable.

Since the shift superintendent is the LED, he is to be kept informed of all emergencies and their disposition. In this instance, the shift superintendent was not informed of the Krypton release until 5:15 PM when contacted by ORO seeking additional information.

E. Personnel Exposure

Krypton-85 is an inert gas which decays to a stable isotope and, therefore, presents no contamination problems and essentially no internal exposure problem. The principal mode of personnel exposure comes from the 670 Kev max beta particle while being submerged in the gas. The skin of the body in this case would be the critical organ.

A total of 9 film badges were processed for personnel who were either directly involved in the release, who were in the building during the release, or who were responding to the release. Only those three people present during the withdrawl of Krypton-85 received any exposure. Preliminary dosimetric determinations of exposure utilizing the TLD[1] and film in the film badge and pocket ionization chambers indicate that exposures of 5, 7, and 20 Rem

[1] TLD- Thermoluminescent dosimeter

to the skin and penetrating exposures of 20, 20, and 250 mRem, respectively, were received. This was preliminary data because unusual patterns appeared on the film which indicated that Krypton-85 diffused into the badge and exposed the components (film and TLDs) from inside. Each reading recorded on an internal dosimetric device is inflated to account for the shielding afforded by the employee's security picture over the radiation monitoring device. The exposure of the dosimetry components from inside the badge will result in the recording of a larger than actual exposure for the individual.

The ORNL security film badge uses both film and TLDs for monitoring personnel exposures. The TLDs are sandwiched between radiation filters and film in a plastic strip with four rectangular holes. These holes are positioned under the filters (cadmium, aluminum, cadmium gold cadmium sandwich, and a bare window). For the employees involved in this release, TLDs are positioned under the open window, aluminum, and cadmium gold cadmium sandwich filters. The film exposure patterns show distinctive outlines of the holes used to hold the TLDs and the darkest spot was under the cadmium filter. This darkening could not come from beta particles penetrating the front of the badge (the cadmium shielding is too great) but most probably came from gas being trapped inside the hole used to hold the TLDs. ORNL has performed a series of experiments and proved that Kr did diffuse into the badge (see Exhibit 5). As a result, the original dose estimates have been revised and are officially recorded as follows:

Employee	Skin	Penetrating
A	15 Rem	100 mRem
B	6 Rem	30 mRem
C	4 Rem	20 mRem

ERDA Manual Chapter Appendix 0524, Part 1A, specifies the annual allowable radiation exposure to the skin is 15 Rem and the allowable quarterly exposure is 5 Rem.

Since January 1, 1976, Employee A has received a total skin exposure of 15.9 Rem and will work at a job that will not contribute significantly to his skin exposure until January 1, 1977. Employee B will be similarly restricted until July 1, 1976. In the opinion of medical personnel and an interpretation of radiation standards, both agree that there will be no adverse health affects from a 15 Rem skin exposure.

F. Release Detection

The release was first detected by a beta gamma monitor which was external to the cell exhaust and then by a monitron and a CAM, all located on the top of the cell. A CAM on the ground level, southside of the cell, alarmed, and then a CAM on the northside of the cell alarmed. There was no air sampling at the withdrawal station. The withdrawal operation was completed and the amount of time required to heat the Kr in the cold trap and fill the shipping cylinder takes from two to five minutes. Although the cell exhaust system damper for the north cell was closed, there was sufficient leakage past the damper to draw enough Kr into the cell and exhaust duct to cause the radiation monitoring devices on top of the cell to alarm first. The geometry of these three radiation detectors with respect to the cell exhaust duct is such that direct radiation from the Kr 514 Kev gamma inside the duct could cause the devices to alarm.

The amount of time for the Kr to diffuse or for air flow patterns to carry the Kr to the two CAMs on the ground floor is unknown. It is known by observation they alarmed after the devices on top of the cell alarmed.

IV. ANALYSIS

The diffusion system was shut down after the release occurred, and personnel in the Radioisotopes Department assumed there was no longer a problem even though CAMs and monitrons were alarming throughout the building. Even though plant emergency units would have offered little assistance in this case, the shift superintendent and the occupants of adjoining buildings should have been timely informed and Health Physics summoned. ORNL's emergency procedures are clear on that point.

Since it was assumed that no problem existed once the building was ventilated, no other emergency activities ensued. As a result, all personnel involved in the release were not identified or retained for dosimetric evaluation. Health Physics was not contacted to evaluate the significance of the release. As identified in the Facts Section, conflicting statements exist regarding whether or not occupants of Building 3026D were informed of the release. Only when the Krypton affected operations in Building 3026D was Health Physics called for assistance.

At some unknown time in the past (probably years), a decision was made to alter the cell ventilation system by closing the exhaust dampers which defeated their intended purpose. Tests have shown that this greatly affects the inleakage of air to the cell through the withdrawal station. The position of the leaking connection (rubber hose from the manometer to copper tubing tee) is such that inleakage of air to the cell sweeps across it. Changes to systems affecting personnel safety, which includes cell ventilation, require review and approval of Safety and Radiation Control. However, review was never requested for the decision to alter the cell ventilation system by closing the exhaust dampers.

The system safety evaluation states that a health physics man will be present during loading and unloading operations. The interpretation of this statement has been that Health Physics will be available and periodically check the operation. This appears to be a reasonable approach considering the hazard level of the operation and that someone else can monitor the operation using a cutie pie. However, no one was monitoring the withdrawal operation which eliminated the first line of defense for radiation exposure control.

The closest CAM is positioned around the corner and about 18' west of the loadout station. This did not detect the release first. The CAM on the southwest corner of the cell was the first CAM on the ground floor to detect the release. This CAM was passed by all three employees at the loadout station as they evacuated the building.

Normally, a cylinder can be filled from a full cold trap in about two to five minutes. The withdrawal having the release was no exception. The first alarm sounded as withdrawal operations were completed; therefore, Employee A was in a cloud of Krypton from about two to five minutes.

Using a rubber band as a hose clamp is accepted practice with Kr gas operations at ORNL. This practice is not always used and is not acknowledged in the operating procedure or safety evaluation for the thermal diffusion process. The use of a rubber band, as unsophisticated as it sounds, is considered quite satisfactory by operators and supervision alike; and minimal testing has shown this connection to be stronger than the tubing.

In general, it can be said that the probability of a release occurring is greater when material is either added or withdrawn from a fixed system or process. Additions and withdrawals involve changes to the fixed or standard configuration of a system, and most incidents can be associated with a change. This incident is no exception. Withdrawal of Kr from the thermal diffusion system is a change in the normal operation of the system. The lack of rubber bands as clamping devices was a change from conventional practice, and the closed exhaust damper was a change in the safety evaluation. This is not to say that changes when properly addressed and reviewed are neither necessary nor good. Additions and withdrawals of Kr from the system are necessary, but not addressed in the system safety evaluation. The change in the ventilation system did not receive the required review by Safety and Radiation Control. Hose clamping with rubber bands or some other device is not specifically required in either the operating procedure or on the safety evaluation.

See Figure 11 for a graphic display of the events and causal factors leading to the release and subsequent radiation exposures.

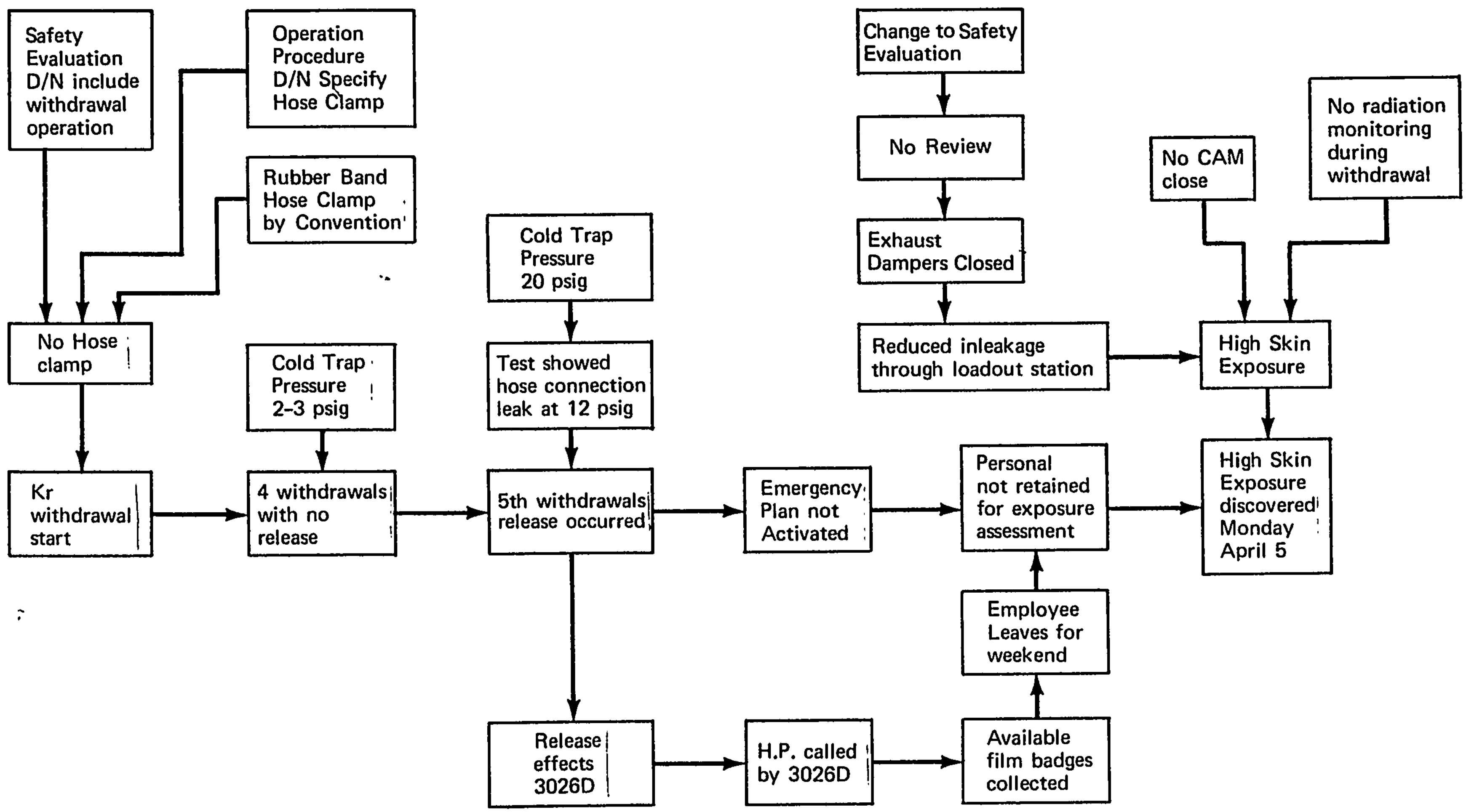


FIGURE 11. EVENTS AND CAUSAL FACTORS CHART

Fig. 11

V. CONCLUSIONS

1. The emergency activities at the site of the Krypton release were not entirely in accordance with established procedures.

2. Personnel exposures may have been reduced had the area been monitored for radiation, the cell ventilation dampers been open, or a CAM been sampling closer to the withdrawal operation.

3. Had the rubber tubing been clamped, the release may not have occurred.

4. The significance of a release during withdrawal operations has not received adequate attention in the system safety evaluation, operating procedures, or emergency procedures.

5. A change in the cell exhaust ventilation operating procedures should not have been implemented without laboratory review and approval.

6. No adverse health effects will occure as a result of a 15 Rem skin exposure.

VI. PROBABLE CAUSE

The release probably occurred where the rubber hose from the manometer attached to the copper tee. Contributing to the release was the absence of a hose clamping device which probably would have prevented the release. Personnel radiation exposures were probably affected by the lack of early release detection and the closed dampers on the cell ventilation exhaust system.

VII. JUDGMENT OF NEEDS

1. There is a need to evaluate the withdrawal operation equipment and procedures for safe operability.

2. There is a need to reemphasize emergency procedures and require they be put into affect for unusual occurrences having the remotest possibility of producing personnel exposure, effecting other operations, etc.

VIII. SIGNATURES OF INVESTIGATORS

Richard D. Smith, Chairman

Edward Fox, Member

Mary Ann Parks, Member

LIST OF EXHIBITS

1. Letter of Appointment
2. Krypton-85 Thermal Diffusion Process Safety Evaluation
3. Materials Specification 15-AC-11a
4. Product Withdrawal Procedure
5. Personnel Exposure to ^{85}Kr (ORNL internal correspondence)
6. Ground Level Concentrations Due to Stack Discharge (ORNL internal correspondence excerpt)

EXHIBIT 1

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

April 6, 1976

Richard D. Smith, Safety and Environmental Control Division

INVESTIGATION OF KR-85 RELEASE OCCURRENCE AT ORNL 3026 BUILDING
ON APRIL 2, 1976

You are hereby appointed Chairman of a Board to investigate the occurrence involving an accidental release of ^{85}Kr from the ORNL 3026 Building on April 2, 1976. The following persons are also appointed as members of the Board:

Edward R, Fox, Jr., Uranium Enrichment Operations Division
Mary Ann Parks, Engineering Division

The Chief Counsel has designated Phillip M. Kannan as legal advisor to this Investigation Board.

You are to perform a Type B investigation of this incident and to submit a draft report to me by April 23, 1976. This investigation is to be the first priority assignment of the Board members and they are relieved of their other duties to the extent necessary to carry out this assignment.

for Charles A. Keller
R. J. Hart
Manager

OS:WLS

cc: C. A. Keller
J. W. Range
J. A. Lenhard
H. O. Baker
W. H. Travis

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

ORIGINAL

September 27, 1965

KRYPTON-85 THERMAL DIFFUSION PROCESS SAFETY EVALUATION

W. R. Rathkamp and R. A. Robinson

PHYSICAL PLANT

Building and Cells

The thermal diffusion facility for enriching the ^{85}Kr content of fission product krypton from 6 to 45% mole concentration will be located in Building 3026-C.

The east end of the building contains two banks of four cells each; the krypton process facility will occupy Cells 2 and 4 in Bank 2, which are the extreme northeast and southeast cells. Since the process involves a non-condensable inert gas, there will be no problem of surface contamination in the event of leakage, so there are no liners in the cells. The shielding consists of two feet of concrete, which is more than adequate for the relatively weak (0.5-mev gamma and 0.7-mev beta) activity associated with ^{85}Kr.

Access to the cells will be through removable concrete roof blocks, which will be opened only for cell maintenance and not during normal operations, and one 20-by 26-in. doorway in each cell, closed by a 7-in.-thick steel door. This door will be opened during part of the normal operation; the shielding during this time consists of 4 in. of Plexiglas permanently mounted in the doorway and 2 in. of lead brick.

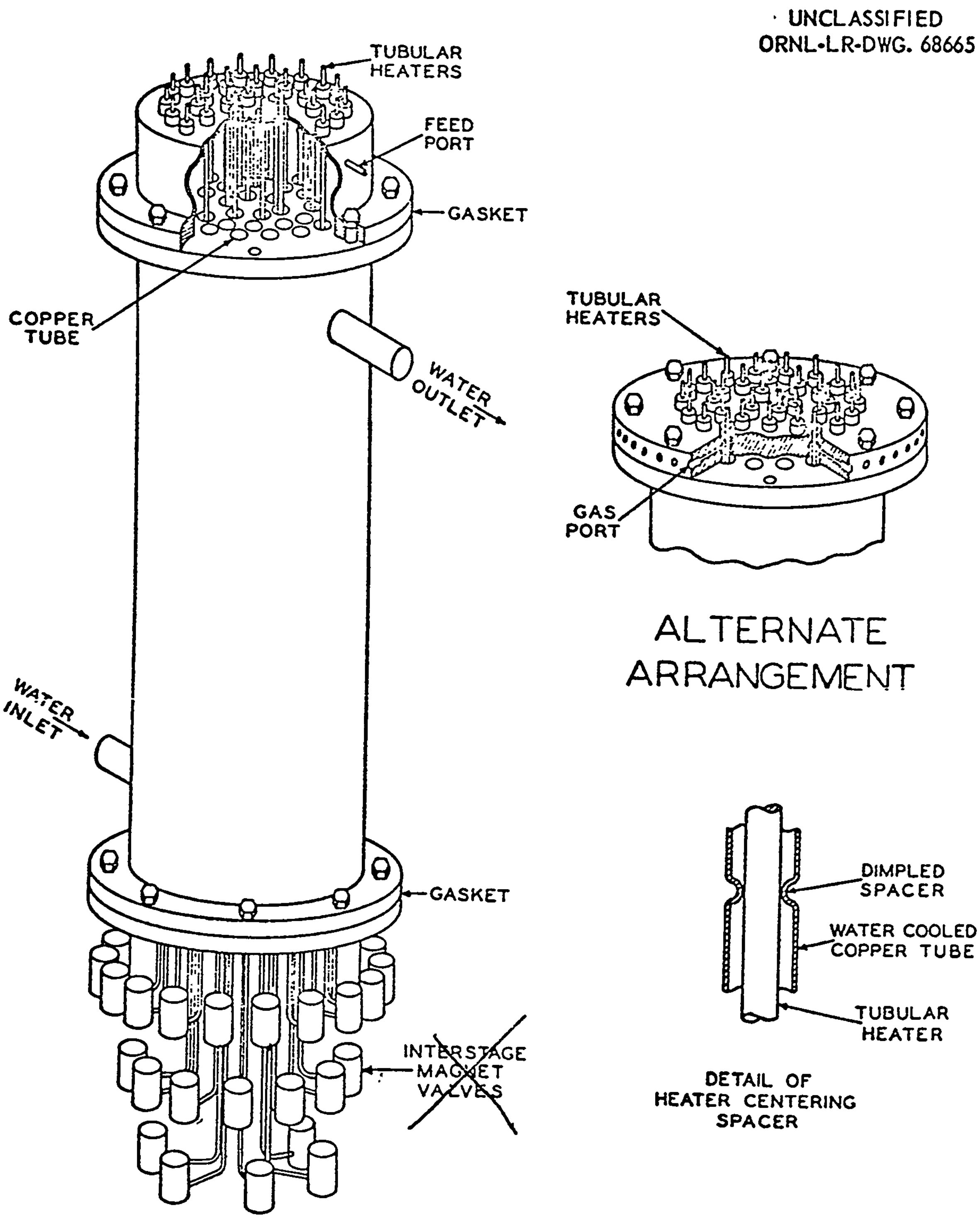
The services to the cell consist of 460-v 3-phase and 110-v single-phase electrical power, a vacuum jacketed liquid nitrogen line, and cooling water supplied by a self-contained cooling tower.

Equipment

The basic equipment in each cell consists of three thermal diffusion column bundles, each of these units being ~8 ft tall and 18 in. in diameter (Fig. 1). These units are very similar to standard surface heat exchangers in form and are constructed of stainless steel and copper. The internal volume containing the process gas is ~10 liters/unit.

The thermal diffusion process carried out in this equipment employs a tubular heater at 600°C enclosed by a water-cooled tube. An isotopic enrichment of the components of an elemental gas in the annular space between heater and tube is achieved due to the temperature gradient.

As auxiliary equipment to the basic thermal diffusion units there are three pulse pumps, one for each unit, located outside the cell and shielded by lead brick housing. Also, three freeze-out traps are located inside the cell to be used in loading, transferring internally, and unloading the



Thermal Diffusion Column Bundle.

process gas. A mechanical vacuum pump discharging into the cell ventilation duct is used to pump the air out of the columns and traps prior to loading.

In addition there will be present, during loading and unloading operations, shielded transfer containers used to bring in feed and remove product and depleted reject material.

CONTAINMENT

Cells

Since the radioactive material in process is a non-condensable gas, no filters are provided in the cell ventilation system and there are no access ports into the cell. There are 14 valve stems coming out of the cell through close fitting holes in the aforementioned Plexiglas shield, and this will be a point of small air inleakage; all other openings will be sealed.

The only process line common to the cells is a process water connection to provide evaporation makeup to the cooling tower. The possibility of any contamination getting into this line is extremely remote.

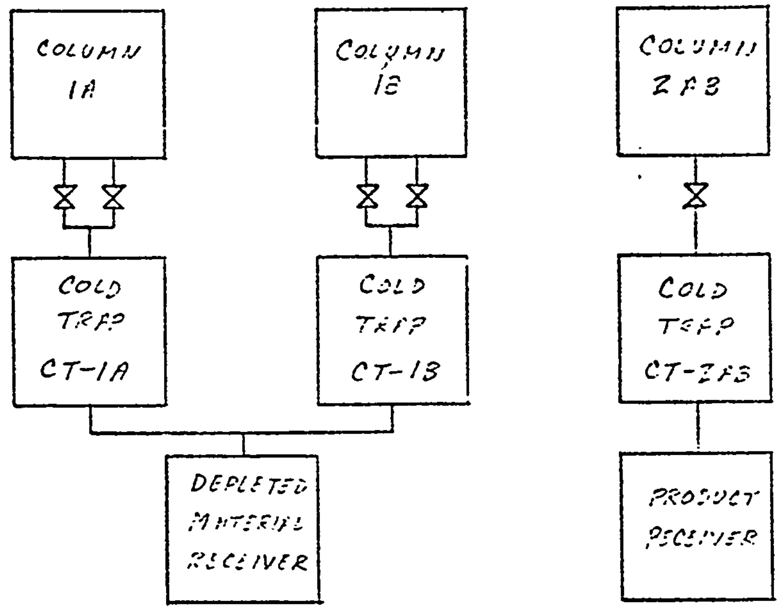
The normal operating pressure in the system is 2 psig, and there is no possibility of dangerous pressures developing as the system is a closed loop with nothing being put in or taken out during the enrichment process. There is a possibility of dangerous pressures developing in the freeze-out traps during loading and unloading operations. To prevent damage from occurring if high pressure should build up, blow-out plugs will be provided to dump the gas from the traps into a receiver where the much larger volume will hold the maximum pressure to safe values.

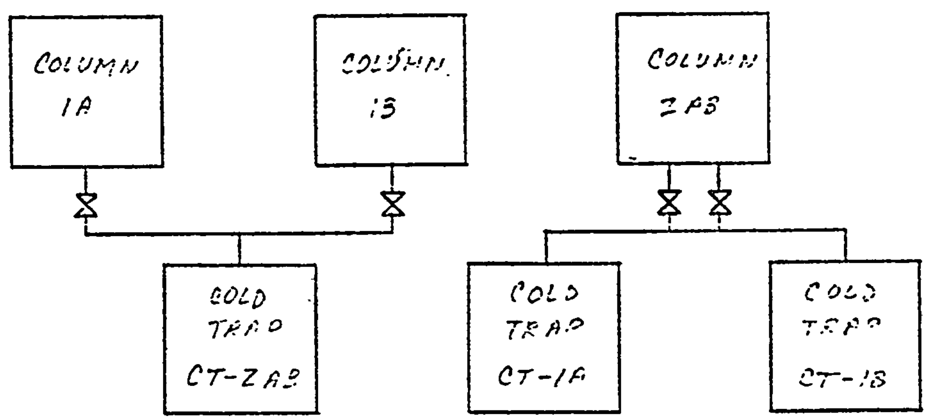
Building

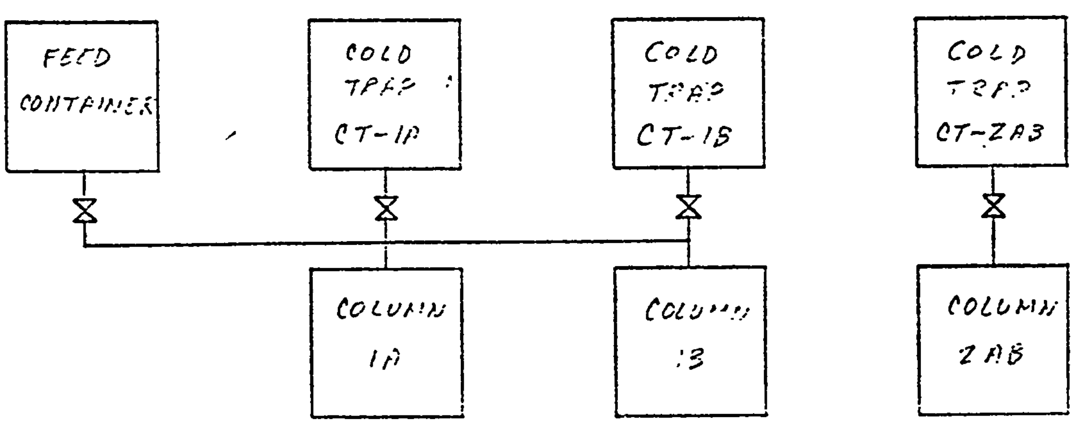
Since the radioactive material in process is a non-condensable gas, there is no reasonable possibility of containment of material within the cell or the building in the event of leakage. Any loss of material will be dissipated in the air through normal ventilation with no residual contamination.

CHEMICAL PROCESS

The process, in general, consists of transferring feed material from cylinders into the thermal diffusion system, turning on the cooling water and the heaters, waiting 60 days while the thermal diffusion effect causes isotopic gradients to develop along the system, then isolating the system into sections and transferring out of the cell the depleted cut, the product cut enriched in ^{85}Kr, and making some internal transfers between the two phases of the plant (Fig. 2).


COLUMN 1A
COLUMN 1B
COLUMN 2AB
COLD TRAP CT-1A
COLD TRAP CT-1B
COLD TRAP CT-2AB
DEPLETED MATERIAL RECEIVER
PRODUCT RECEIVER


COLUMN 1A
COLUMN 1B
COLUMN 2AB
COLD TRAP CT-2AB
COLD TRAP CT-1A
COLD TRAP CT-1B


FEED CONTAINER
COLD TRAP CT-1A
COLD TRAP CT-1B
COLD TRAP CT-2AB
COLUMN 1A
COLUMN 1B
COLUMN 2AB

With the exception of the initial startup, the operation of the process should be routine with few, if any, procedural changes.

There are no chemical reactions or reagents used in this process, with the exception of the inert but radioactive process gas, krypton, and liquid nitrogen used to transfer the gas by freezing into cold traps.

CRITICALITY

There is no criticality hazard associated with this process.

OPERATING SAFEGUARDS

There is nothing to be done to the process during the normal 60-day operating cycle except to check the meters and gages and observe any changes in their readings. Such changes may be interpreted as signs of trouble that may or may not require any immediate action. A check list will be used, requiring daily notes.

The system is interlocked to shut itself down in the event of serious malfunctions. Past experience in operating similar systems with non-radioactive material has proven that normal day shift attendance is sufficient. Attention on the 4 to 12 and 12 to 8 shifts and on weekends is not necessary.

The procedure of loading and unloading process gas will be spelled out in a step by step specification of the condition of all valves and switches in the system, the time required, and any additional operations needed for each phase of operation.

Six thermoswitches, one on each column, will shut the system down if the cooling water supply should become insufficient for any reason. If dangerous pressures should develop in the cold trap, rupture discs will dump the gas into sections of the system with adequate volume to hold the material at safe pressures.

Gas inventories are controlled by measuring the pressure in a known volume and calculating the amount of gas present.

PERSONNEL EXPOSURE

The normal total load in each cell will be 3×10^3 curies. During loading and unloading, there will be ~1000 curies of feed material — 985 curies of product material and 15 curies of depleted waste material — in transfer carriers on the floor outside the cell waiting for transfer to Building 3034.

During the normal 60-day operating cycle the cell doors will be closed and there will be negligible exposure to any personnel.

During loading and unloading operations, there will be a minimum of one supervisor, one technician or operator, and one health physics man present. In addition to the existing permanent shielding, temporary lead shielding will be erected at this time to keep exposure within tolerance.

RADIATION AND CONTAMINATION CONTROL

There are several radiation monitors permanently installed in the building (Fig. 3). In addition, charcoal trap samplers will be installed in the cell ventilating duct to detect any slow escape of gas. These samplers will be removed and counted from time to time. Since the active material is a gas, only air monitors will be of value.

There is no way to enter the cells accidently, since all entries are blocked by permanent shields requiring considerable effort to remove.

PROCESS SAFEGUARDS

There are no process solutions used in this system, hence there is no problem of protecting equipment. The cooling water used is confined within stainless steel piping and jackets.

There is no complicated control instrumentation to be maintained. All controls consist of relays, manual switches, and thermal protective switches, all of which are simple off and on devices.

LIQUID AND SOLID WASTE

Normally no radioactive waste of any kind will be released into the cell; there are no solid wastes associated with this process.

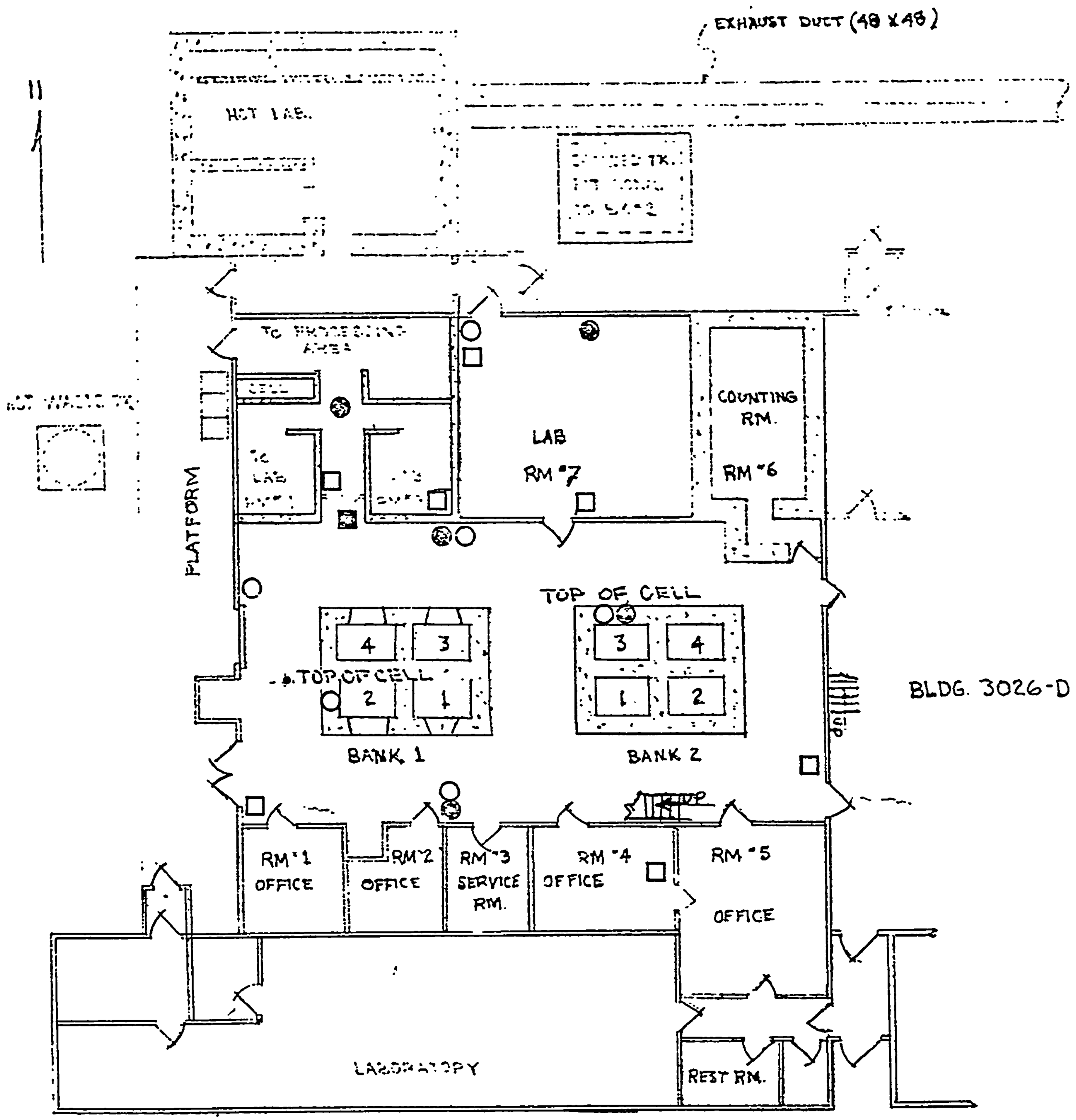
GASEOUS WASTE

The feed gas will eventually be removed in two fractions — one the high activity product and the other depleted, but still marketable, material. During normal operation no radioactive gases are released to the stack.

CELL VENTILATION

The interior of the cell will be maintained at >1.0 in. water below outside atmospheric pressure. The primary containment of the activity is the sealed thermal diffusion system, and only in the event of a leak in this system will any activity enter the cell outside the system. There are no filters in the ventilation system since the activity is in gaseous form and cannot be filtered out.

The cells are connected to the area stack system (3039) and in the event of a power failure, an emergency steam turbine system will maintain cell negative pressure.



BLDG. 3026-C
FIRST FLOOR PLAN

○ MONITRON

CAM

□ Q-2091 BETA-GAMMA

Q-2091 ALPHA

A-PE-15-4

PROCESS HAZARDS

Since the active material is an inert gas, krypton, and there are no chemical reactions involved, a chemical-type explosion is impossible.

If any activity should escape from the columns through an accidental leak, there will be no long-term contamination problem, since the active gas will promptly be removed by the cell or building ventilation system. Since the activity is normally confined within a metal system, loss of cell ventilation alone will have no effect on containment.

The maximum credible incident would be the explosion of a liquid nitrogen trap while transferring process gas. This could only be possible through a sequence of improbable events. If the liquid nitrogen should be lost from the trap system while all valves leading to the trap are closed and if for some reason the rupture discs provided in the system failed to blow out, dangerous pressure would develop. However, even in this case the system should be strong enough to resist exploding. An explosion of a trap would not be a direct danger to personnel, but under the worst conditions up to 1000 curies might be released into the cell and be vented up the stack. Part of this might be blown out of the cell and provide an exposure to personnel until the building ventilation removed the gas.

Any activity released will remain airborne and be dissipated and there will be no fallout.

In the event of a mechanical failure of piping, joints, or components, a maximum of 80 curies might be released rapidly into the cell and up the stack, followed by a very small rate of leakage until the system is shut down.

The normal operating pressure in the thermal diffusion system will be 2 psig. The maximum pressure that can develop in the gas transfer system will be 100 psig. At this pressure, rupture discs will dump the gas back into the large volume of the thermal diffusion tubes.

Approved For Procurement

15-AC-11a
January 8, 1959
Page 1 of 2

A Materials Specification[1]

UNION CARBIDE NUCLEAR COMPANY

DIVISION OF UNION CARBIDE CORPORATION
U. S. Government Contract W-7405-eng-26

SUPERSEDES
15-AC-11
May 8, 1958

TUBING, LATEX, LABORATORY STYLE

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers translucent latex rubber tubing for laboratory use where high purity is required.

1.2 Classification. The latex tubing shall be supplied in one grade and in the sizes listed in table I, and as specified in the invitation to bid or purchase order.

Table I - Dimensions of Tubing

Light Wall		Heavy Wall		Pressure	
Inside Diam.	Wall Thickness	Inside Diam.	Wall Thickness	Inside Diam.	Wall Thickness
1/8	1/32	3/16	3/32	1/16	3/16
1/8	3/64	3/16	1/8	1/8	3/16
3/16	1/16	1/4	3/32	3/16	1/4
1/4	1/16	1/4	1/8	1/4	3/16
5/16	1/16	5/16	3/32	5/16	3/16
3/8	1/16	5/16	1/8	3/8	3/16
1/2	3/32	3/8	3/32	1/2	1/4
---	---	3/8	1/8	5/8	1/4
---	---	1/2	1/8	---	---
---	---	1/2	3/16	---	---
---	---	3/4	1/4	---	---
---	---	1	1/4	---	---

1.2.1 Color. The tubing shall be amber colored.

2. APPLICABLE SPECIFICATIONS, STANDARDS AND OTHER PUBLICATIONS

The Requirements Section (3) of this specification is comparable to applicable portions of Federal Specification ZZ-T-831b (3), Tubing; Rubber, Grade D - Latex Tubing.

The Sampling, Inspection and Test Procedures Section (4) of this specification is comparable with applicable portions of Federal Test Method Standard No. 601, Rubber; Sampling and Testing.

3. REQUIREMENTS

3.1 Rubber. The tubing shall be made from liquid latex by the dipping process.

3.2 Workmanship. The tubing shall be free from any defects which may affect its serviceability.

3.3 Dimensions

[1] [illegible] Oak Ridge, Tennessee, and Paducah, Kentucky, operated for the U. S. Atomic Energy Commission

3.3.1 Inside Diameter and Wall Thickness. The inside diameter and wall thickness shall be as listed in table I. The tolerances shall be ± 1/64 inch on all sizes up to and including 5/16 inch ID. The tolerances on larger sizes shall be proportionately greater.

3.3.2 Length. The tubing shall be supplied in lengths of not less than 12 feet.

3.4 Physical Requirements. The tubing shall meet the requirements specified in table II.

Table II - Physical Requirements

Specific gravity, maximum	0:95
Tensile stress at 100 percent elongation, maximum, p.s.i.	125
Tensile strength, minimum, p.s.i.	3000
Ultimate elongation, minimum, percent	700

3.4.1 Accelerated Aging. The tensile strength of the tubing after having been subjected to circulating air at a temperature of 158° ± 2°F. for 7 days shall not decrease more than 25 percent.

4. SAMPLING, INSPECTION AND TEST PROCEDURES

4.1 Sampling. Acceptable sampling to determine conformance with this specification is as follows: from each lot of latex tubing offered for delivery at the same time, three feet from each size shall be taken for inspection and test purposes.

4.2 Inspection. The tubing may be inspected to determine compliance with this specification with regard to color, dimensions, bleeding, blooming, porosity, smoothness, tackiness, and workmanship. Failure of any size of tubing to pass inspection may be deemed sufficient cause for rejection of the defective size.

4.3 Tests. The following tests are recognized for determining conformance to Section 3 of this specification.

4.3.1 Specific Gravity. The specific gravity shall be determined by Method 14021, Federal Test Method Standard No. 601, Rubber; Sampling and Testing.

4.3.2 Tensile Strength, Ultimate Elongation, and Tensile Stress. The tensile strength, ultimate elongation and tensile stress at 100 percent elongation shall be determined by Methods 4111, 4121 and 4131 in Federal Test Method Standard No. 601.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Commercial packaging is acceptable.

5.2 Packing. The material shall be delivered in standard commercial containers of the type, size, and kind normally used for this purpose. They shall be so constructed as to insure acceptance and safe delivery by common carriers, at the lowest rate, to the point of delivery called for in the invitation to bid or purchase order.

5.3 Marking. Packages shall be marked with the following information:

Vendor's name
Descriptive name of item
Size
Quantity

5.4 Shipping Containers. Shipping containers shall be marked with the following information:

Vendor's name
Descriptive name of item
Purchase order number
Letter release number (if any)

3/4/75

DRAFT

EXHIBIT 4

PRODUCT WITHDRAWAL

Operation	Reason
1. Take decayed scaler reading and record	1. From the decayed scaler reading, the percent krypton-85 can be determined. From attached table (Table 1) the number of columns required to get the percent krypton-85 can be determined and isolated
2. Center krypton-85	2. The higher percentage krypton-85 gas will be out of center four (4) columns to the light isotope side. To get it back to the center, while watching decayed scaler, bleed stable isotope from high side to storage tank or to a container at load station
3. Select shipping container	3. Select the size shipping container that will hold the amount of krypton that is to be withdrawn
4. Hook shipping container to column	4. With 1/4-in. copper tubing connect the shipping container to withdrawal line in load station. Have a manometer in the withdrawal line
5. Open shipping container valve	5. Open valve to shipping container for evacuation
6. Open vacuum valve	6. Open vacuum valve and evacuate cylinder and line to the VCT valve to as low as possible
7. Isolate columns	7. From attached Table 1, determine how many of the columns will have to be isolated, and close the valves that will leave the percent krypton-85 that is desired in the center of the column
8. Open VCT valve	8. Open VCT valve to the column that withdrawal is being made from. Check and be sure the other two (2) VCT valves are closed. Evacuate the cold trap. Check manometer
9. Valve off vacuum pump	9. Close the vacuum valve and leave vacuum pump running
10. Check 1B and 2B valves	10. Check that 1B and 2B valves on column withdrawal is being made from are closed

Product Withdrawal (Continued) Operation	Reason
11. Open 1C valve	11. Open 1C valve. This opens the center section of columns to make the withdrawal from center of column
12. Open VP valve	12. Open the VP valve very slowly, regulati the flow of krypton-85 from the column to cylinder. Watch manometer to tell when the desired amount of krypton-85 has been withdrawn. If the column and cylinder pressure equalizes before the desired amount of krypton-85 is in the cylinder, the cold trap will have to be used. Go to Step 20
13. Close VP valve	13. If enough krypton-85 is received in the shipping cylinder before the pressure equalizes, close VP valve
14. Close shipping cylinder valve	14. Close shipping container valve
15. Close IC valve	15. Close the 1C valve on center of column
16. Close VCT valve	16. Close the VCT valve in load station
17. Open vacuum valve	17. Open the vacuum valve to evacuate the transfer line. The amount of krypton loss to stack will be <100 cc
18. Disconnect shipping container	18. Disconnect shipping container with vacuum on line to prevent krypton-85 from coming out into building
19. Open column valve	19. Open the valves on column that was close to isolate the section of column to jet the percent krypton at Step 7. The valves that are normally open during operation are the 1D, 2D, 1E, and 2E on each column. The valves normally closed during operation are 1B, 2B, and 1C valves. All valves in load station
20. Pressure equalizes	20. If pressure in column and shipping cylinder equalizes, use the cold trap to pump the desired amount of krypton-85 from column to shipping cylinder
21. Close VCT valve	21. Close this valve in load station

Product Withdrawal (Continued)

Operation	Reason
22. Hook Ln_2 line to cold trap	22. Fill Ln_2 Dewar in load station. The cold trap as it freezes will pull krypton-85 from column and freeze it ou
23. Close Ln_2 tank valve	23. Close Ln_2 valve to cold trap
24. Close VP valve	24. When cold trap is filled, close VP valv
25. Turn on cold trap heater	25. On panelboard on north wall of Cell 4 turn on cold trap heater switch
26. Check sim-ple-trol	26. Watch sim-ple-trol on top of load station, to see when temperature reaches 0°
27. Turn off cold trap heater	27. Turn off cold trap heater and let cold trap continue to heat up
28. Check gage	28. Watch gage in load station to see when pressure reaches ∿5 lbs
29. Open VCT valve	29. Open VCT valve and let the pressure go into shipping cylinder
30. Repeat Steps 20 through 29	30. Repeat Steps 20 through 29 until the desired amount of krypton-85 is in shipping cylinder
31. Go to Step 13	31. After shipping container has the required amount of krypton-85, go to Step 13 through 19

4/29/76 - cm

INTRA-LABORATORY CORRESPONDENCE

EXHIBIT 5

OAK RIDGE NATIONAL LABORATORY

April 28, 1976

4/30/76 Copy RDSmith
per RGAffel

To: D. M. Davis

From: E. D. Gupton EDG

Subject: Personnel Exposure to ^{85}Kr

The developed image in the film from the badge of Employee A who was exposed because of a leak of ^{85}Kr was evidence that some Kr had diffused into the badge. The ^{85}Kr betas which originated in gas within the badge would have deposited energy in the dosimetric devices in a manner and to a degree that the dose equivalent to Employee A's skin would have been overestimated by our routine evaluation procedures.

Experiments have been done by Operations and Applied Health Physics staff to expose badge meters to various concentrations of ^{85}Kr in air. A desiccator was adapted so that badges could be mounted around the inner periphery. With the cover of the desiccator in place and with the gaseous environment being air at atmospheric pressure, a mixture of ^{85}Kr and air was allowed to flow into and exhaust from the desiccator for five minutes. The cover was then removed and the badges were retrieved. The effect of ^{85}Kr on badges sealed against its entry was compared with the effect on the usual, unsealed badge. The effect of time lapse post exposure until removal and processing of the dosimetric devices of the unsealed badges was studied.

It was found that Kr diffused readily and quickly into an unsealed badge with the result that the dosimetric devices were exposed to betas which originated within and without the badge. Most of the Kr diffused rather soon from within the badge after its removal from the Kr atmosphere; however, a small fraction of the Kr diffuses from the materials in the badge at a slower rate.

On the basis of the experimental results it is estimated that at least 25% of the apparent (initially calculated and reported) skin dose equivalent of Employee A was because of gas inside the badge.

The data which were obtained initially from the badges of Employee C and Employee B also have been reevaluated for effect of gas in the badges.

The revised dose equivalents are: Employee A - 15 rem, D S, 100 mrem, D C; Employee B - 6 rem, D S, 30 mrem, D C; and Employee C - 4 rem, D S, 20 mrem; DC.

cc: Dose Data Records

Ground Level Concentrations Due to Stack Discharge

Calculations, employing the Gaussian plume model, were made to estimate the downwind centerline ground level concentrations resulting from this release, assuming that 53 Ci was released through the ORNL 3039 stack. (Estimates made since this calculation was made indicate the release from the 3039 stack was between 25 and 40 Ci of ^{85}Kr.)

At the time of the release, observations made at the CRBR meteorological tower and communicated to ORNL by F. A. Gifford, Jr. of ADTL indicated a moderately unstable atmosphere (B-condition), and a wind velocity of 9.4 miles per hour at the stack height. Winds were predominantly from the southwest.

The peak release occurred over a period of 5 minutes, thus producing a mean release rate of 0.18 Ci/sec. Using this value and the values of the Pasquill-Gifford dispersion parameters for the B-condition found in *Meteorology and Atomic Energy*, 1968, (TID-24190), together with the 9.4 mile-per-hour wind velocity from the southwest at the elevation of the source, the concentration curve shown in Figure 4 was developed.

The relation employed is

$$\chi = \frac{q e^{-h^2/2\sigma_z^2}}{\pi \mu \sigma_y \sigma_z}$$

where

χ = concentration, Ci/m^3

q = source, Ci/sec

μ = wind velocity, m/sec

h = effective stack height, m

= $74.4 + 51.75/\mu$ (from ORNL-TM-3187)

σ_y, σ_z = horizontal and vertical dispersion parameters, m

The MPC's for krypton-85 are:

$$MPCa_{40} = 1 \times 10^{-5}\ \mu Ci/cm^3$$

$$MPCa_{168} = 3 \times 10^{-6}\ \mu Ci/cm^3$$

$$MPCa_{non-occ} = 3 \times 10^{-7}\ \mu Ci/cm^3$$

Table 1 summarizes the calculational results.

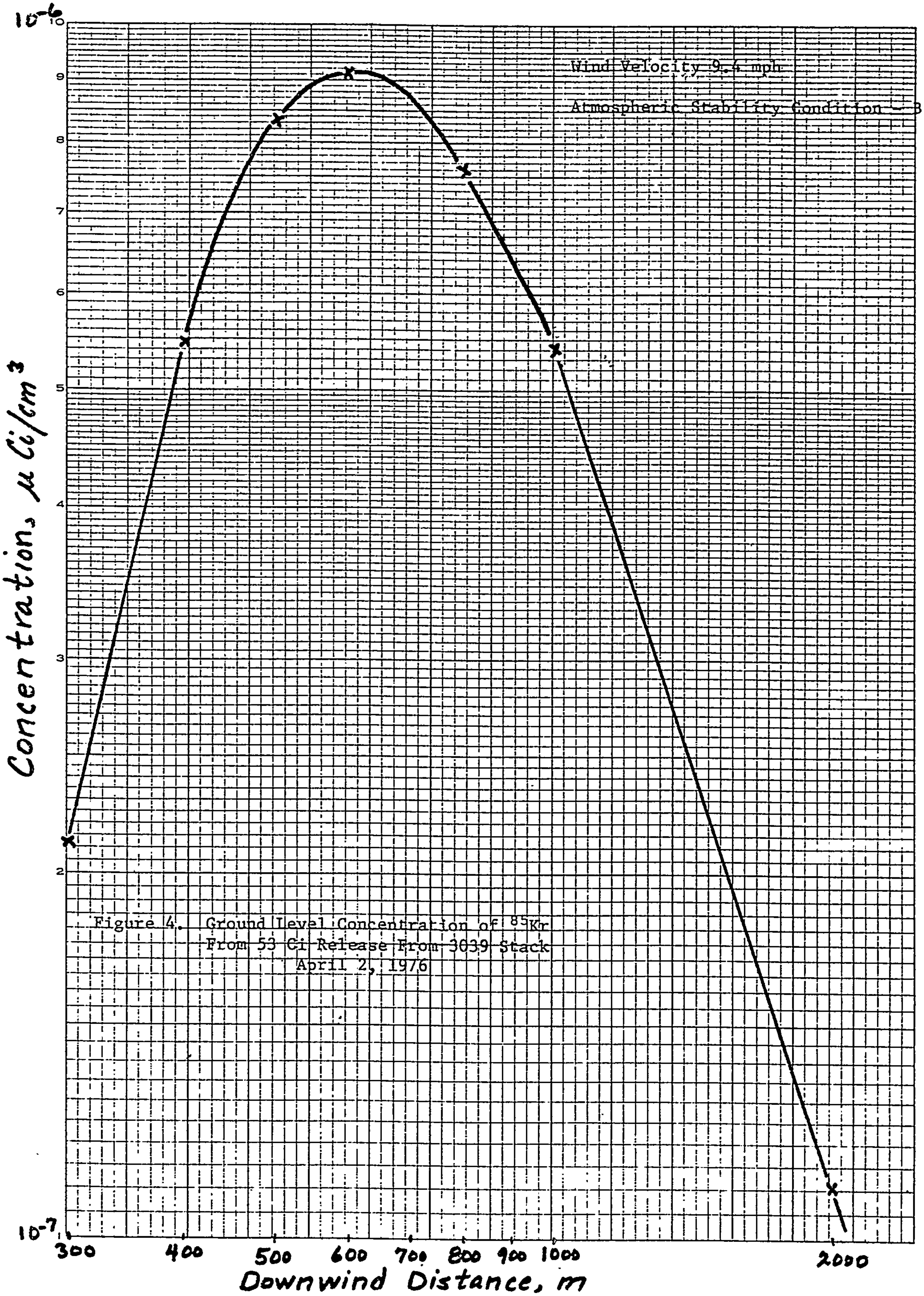


Figure 4. Ground Level Concentration of ^{85}Kr From 53 Ci Release From 3039 Stack April 2, 1976

Table 1. Summary of Values of Downwind Krypton-85 Concentration Resulting from 53 Ci Release from 3039 Stack (April 2, 1976)

Downwind (NE of Stack) distance, m	σ_y, m	σ_z, m	χ $\mu Ci/cm^3$
300	48.5	32	2.23×10^{-7}
400	65	41	5.46×10^{-7}
500	81	53	8.33×10^{-7}
600	95	65.8	9.15×10^{-7}
800	124.6	94.9	7.596×10^{-7}
1,000	155	130	5.42×10^{-7}
2,000	291	377	1.21×10^{-7}

The calculated values (presented in Table 1 and Figure 4) indicate a maximum concentration of 9.2×10^{-7} $\mu Ci/cm^3$ for 5 minutes occurs at approximately 600 meters from the base of the stack. The distance is well within the site boundary. This represents an equivalent of 27.6 sec at the occupational exposure MPC or approximately 15.8 minutes at the non-occupational exposure MPC. At 2000 meters from the base of the stack the concentration was 1.21×10^{-7} $\mu Ci/cm^3$ which is below the non-occupational exposure MPC. The site boundary is ∿4100 meters to the NE.

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

① 864
② RF 18

June 30, 1976

1976 JUL 2 AM 9 30

Union Carbide Corporation
Nuclear Division
ATTN: Dr. Herman Postma
Director
Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, Tennessee

Gentlemen:

KR-85 RELEASE AT ORNL BUILDING 3026 ON APRIL 2, 1976

The ORO investigation of this occurrence has been completed and three copies of the investigation report and the recommendations are enclosed for your action as appropriate. Please note that recommendation No.6 was added because of an event related to this occurrence which was reported after the investigation report had been prepared. Therefore, the information on which the added recommendation is based is not included in the report but rather in a separate enclosure (Encl.3).

Please advise me within 30 days of your plans and schedules for implementing the recommendations. Also, I would appreciate your giving me a report on the status of the recommendations each six months until the recommendations are fully implemented.

Sincerely,

Joseph A. Lenhard

Joseph A. Lenhard, Director
Research and Technical Support Division

OS:WLS

Enclosures:
As stated above (3)

cc w/o encl:
R. F. Hibbs, UCC-ND
C. A. Keller, AMO
W. H. Travis, S&EC

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

A9.5

INTRA-LABORATORY CORRESPONDENCE

OAK RIDGE NATIONAL LABORATORY

April 9, 1976

APR 14 AM 10 21

TO: Herman Postma

FROM: F. R. Bruce Original Signed F. R. Bruce

SUBJECT: Reporting of ^{85}Krypton Release

I am a little surprised that we were criticized for being tardy in reporting the April 2 release of ^{85}Krypton. The chronology was as follows:

The accident occurred at 3:15 p.m., April 2. Jim Cox and other responsible individuals were preoccupied with coping with the event until 4:15 p.m., at which time Jim called me. At the time, I was in your office, so Jim called my alternate, M. E. Ramsey, who was also out. He then called and left a message with my office. John Auxier also called at 4:20 p.m. to report the accident. Upon returning to my office at 4:45 p.m., I promptly called ORO and, in the absence of both Lenhard and Haythorn, gave all of the available information to Jim Rounsaville. At 4:55 p.m., Doyle Davis reported that the quantity of material released, originally estimated to be as much as 200 curies, was less than 50 curies and that the badges of the people involved were being processed. At this point, the accident seemed trivial. Rounsaville, who normally does not handle matters like this, apparently reported the event to Wayne Range, who contacted Ed Aebischer. Ed called me at 6:15 p.m., and I promised to give him the exposure information, which I did at about 7:30 p.m.

It was not until Monday morning that we learned that the third man received a 20-rem skin dose, 5 rem over the level which requires reporting within 72 hours. In view of this development, I apprised Ken Bahler of the situation at about 11:30 a.m. on Monday, April 5. Subsequently, Mr. Hibbs called for more information and indicated that he was going to pass it on to Mr. Hart.

In conclusion, ORO had all of the information available to us about as fast as we could have provided it without putting their interest ahead of dealing with the emergency. The event did, however, suggest that we need more people on the roster for passing such information on to ORO. That step, plus the reminder to the staff (copy attached), will I think assure more prompt handling of such cases in the future.

FRB:mb

Encl.

cc: R. F. Hibbs

UCN-430
(3 5-61)

(Handed out in Ex. Comm. Meeting on 4/8/76

INTRA-LABORATORY CORRESPONDENCE

OAK RIDGE NATIONAL LABORATORY

April 8, 1976

To: M. E. Ramsey
C. R. Richmond
M. W. Rosenthal
D. B. Trauger
A. Zucker

From: F. R. Bruce FRB

Subject: Reporting of Unusual Occurrences

ORO has again expressed dissatisfaction with the promptness and completeness of our reporting of unusual occurrences. In order to correct the situation, I should like to ask you to have your people do the following:

1. Review the ground rules for reporting (Standard Practice Procedure D-5-16; memo dated November 14, 1972, from F. L. Culler; and memo dated August 1, 1975, from H. Postma).

2. Even if an occurrence seems trivial, if you cannot immediately and positively dismiss it as nonreportable, please inform me by phone of it right away.

3. The minimum information that is needed in reporting to ORO is the following:

   a. When and where the event occurred,

   b. Brief discription of the event (process or operation involved, what happened, materials involved, etc.)

   c. Consequences (Names of people involved, extent of injury if any, property damage, lost operating or R&D time etc.)

   d. Emergency actions taken, if any.

   e. Followup required, if any.

FRB:epi

cc: F. L. Culler
F. H. Neill
H. Postma
W. R. Ragland
File - RC

UCN-430
(3 5-61)

A9.5-9

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

APR 8 AM 10 11

April 6, 1976

Distribution Date 4/8/76
(* w/o attachment)

Bahler		Bradbury	
Cobert	1	Carter	
Elkins		Jesny	
Fourney		Wilcox	
Horde	1	(PRV)	
Parks	1	Case	
Postma	5	Hopkins	
Vanstrum	1	Winkel	
(RFH)		(CJP)	

Handle or reply

Union Carbide Corporation
Nuclear Division
Attn: Mr. R. F. Hibbs
President
Post Office Box Y
Oak Ridge, Tennessee

Gentlemen:

INVESTIGATION OF KR-85 RELEASE OCCURRENCE AT ORNL 3026 BUILDING ON APRIL 2, 1976

I have appointed an Investigation Board consisting of Richard D. Smith, Chairman; Edward R. Fox, Jr.; and Mary Ann Parks to investigate the occurrence involving an accidental release of ^{85}Kr from the ORNL 3026 Building on April 2, 1976. Attached for your information is a copy of the memorandum of appointment.

Your cooperation with the Investigation Board will be appreciated.

Sincerely,

Charles A. Keller
for R. J. Hart
Manager

OS:WLS

Enclosure:
Copy of Memo of Appoint.

cc: C. A. Keller
J. W. Range
J. A. Lenhard
H. O. Baker
W. H. Travis

ORIGINAL

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

April 6, 1976

Richard D. Smith, Safety and Environmental Control Division

INVESTIGATION OF KR-85 RELEASE OCCURRENCE AT ORNL 3026 BUILDING ON APRIL 2, 1976

You are hereby appointed Chairman of a Board to investigate the occurrence involving an accidental release of ^{85}Kr from the ORNL 3026 Building on April 2, 1976. The following persons are also appointed as members of the Board:

Edward R. Fox, Jr., Uranium Enrichment Operations Division
Mary Ann Parks, Engineering Division

The Chief Counsel has designated Phillip M. Kannan as legal advisor to this Investigation Board.

You are to perform a Type B investigation of this incident and to submit a draft report to me by April 23, 1976. This investigation is to be the first priority assignment of the Board members and they are relieved of their other duties to the extent necessary to carry out this assignment.

for Charles A. Keller
R. J. Hart
Manager

OS:WLS

cc: C. A. Keller
J. W. Range
J. A. Lenhard
H. O. Baker
W. H. Travis